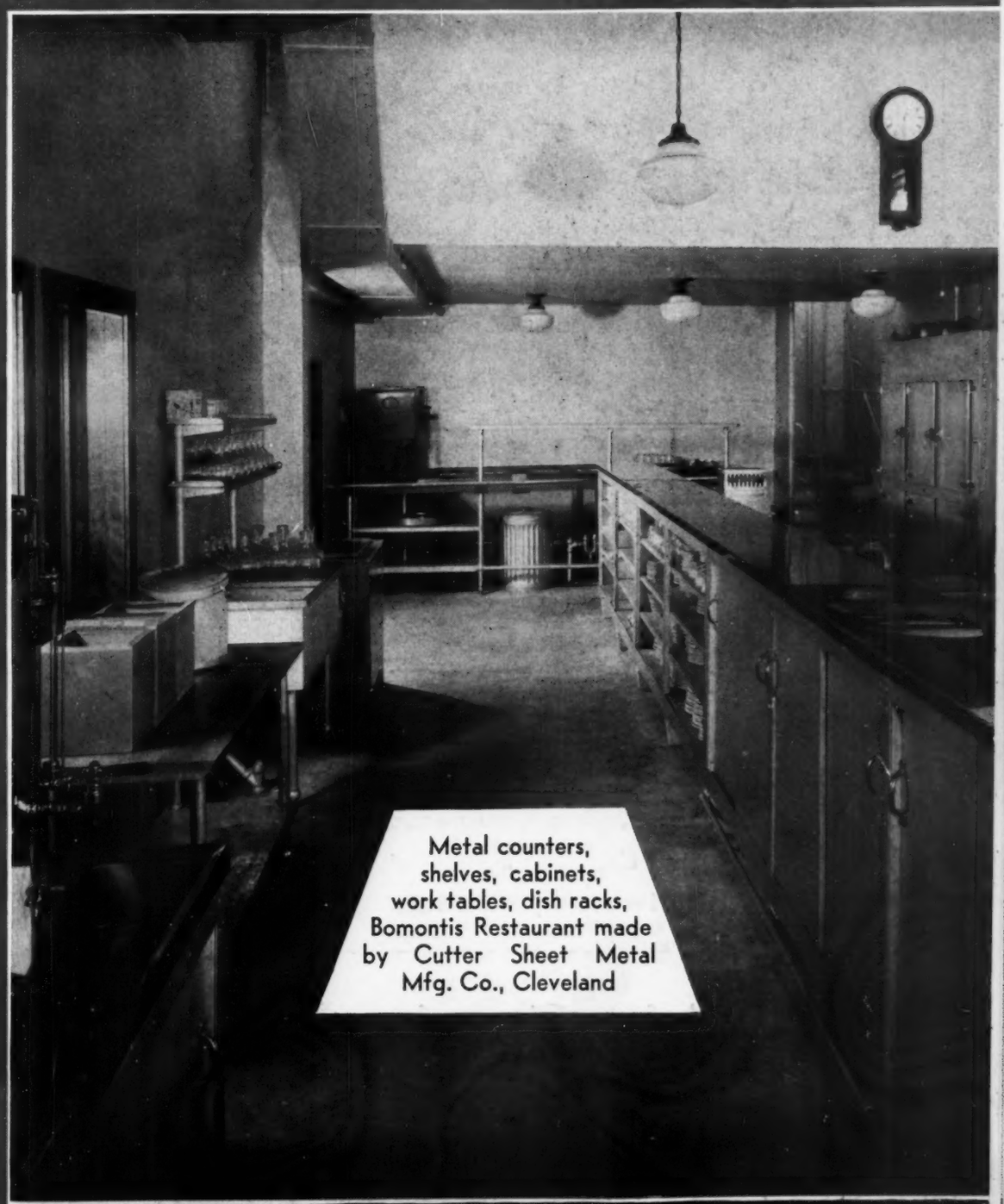
AMERICAN ARTISAN

WARM AIR HEATING • SHEET METAL CONTRACTING • AIR CONDITIONING



Metal counters, shelves, cabinets, work tables, dish racks, Bomontis Restaurant made by Cutter Sheet Metal Mfg. Co., Cleveland

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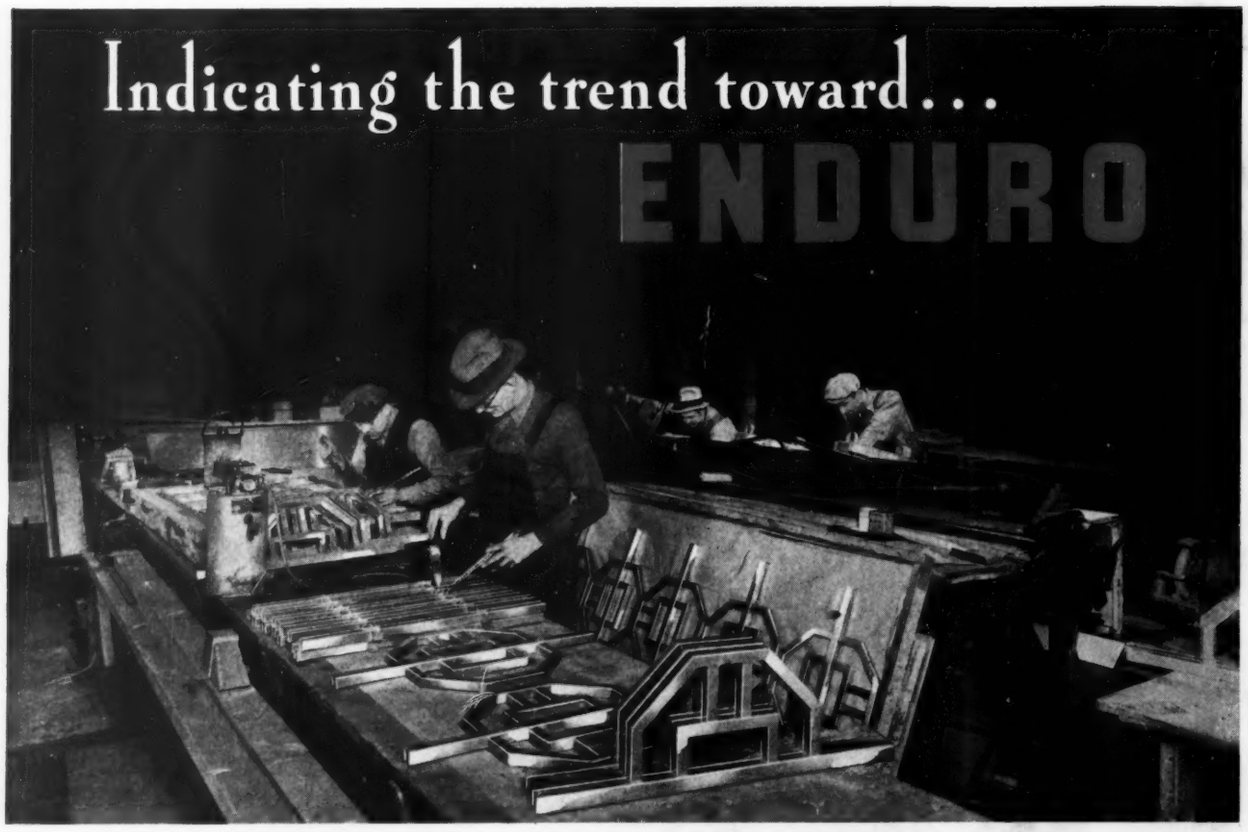
ECEMBER
1935

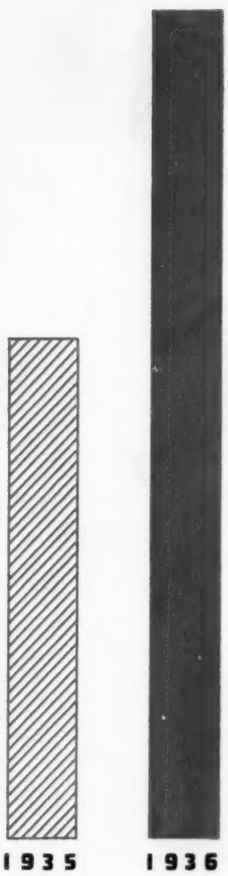


There is a growing market for stainless steel fabricated and sold by the sheet metal trade. Figures prove it.

ENDURO has been responsible for much of the increased popularity of articles made of stainless steel. Sheet metal contractors have found that it is easy to cut, bend, form, solder and weld—that it is easy to sell, because it has been consistently advertised—that it gives them a new selling argument on many old products—and that it enables them to obtain business in the face of competitive bids and still make a worth-while profit.

Consider the use of ENDURO for your next job that demands a metal that has beauty, strength, corrosion-resistance and long life. Use it wherever cleanliness and sanitation are imperative.

In the meantime, let us send you illustrated literature showing hundreds of uses for this modern metal. Write today.



Republic Steel
CORPORATION

Licensed under Chemical Foundation Patents Nos. 1316817 and 1339378.

GENERAL OFFICES · · · YOUNGSTOWN, OHIO
ALLOY STEEL DIVISION · · MASSILLON, OHIO

Only Hold-Heet *can* offer these important features:

1. NOISELESS PLANOIDAL BLOWER.

Not a disk fan, not a centrifugal blower, but a Planoidal Blower fully protected by U. S. patent No. 1,998,184. Absolutely noiseless in operation because two blades turning at a maximum speed of 12½ per second (750 r.p.m.) give 25 beats per second, considerably below 30 which is the minimum audible range of the human ear.

2. BALLENTINE CAPACITOR MOTOR.

A 1/6 h.p., 8-pole variable speed, capacitor motor such as Hold-Heet employs would cost competing manufacturers approximately four times what they actually pay for the cheap types of split phase motors that are used. The customer pays the difference in high operating expense, noisy starting, and the dimmed lights resulting from the 20 to 25 ampere starting current as compared to the Hold-Heet starting current of 4 amperes. A ball bearing thrust in combination with oilless bearings and an enormous oil reservoir in the base provide a combination that requires lubrication but once a year. Only one place to oil.

3. 100-SPEED CONTROL.

Simply turn the control handle to increase or decrease delivery volume as required or to "tune out" duct vibrations. Keep register delivery temperatures uniform and comfortable by adjusting to low speed in mild weather and by increasing volume when the heating plant is being forced in cold weather.

The 3 Big Furnace-Blower Developments are Exclusively Hold-Heet

Other Exclusive Hold-Heet Features:

4. 48% Static Pressure Efficiency.

This remarkable efficiency may be best appreciated when one learns that the new blower, recently heralded with much acclaim by one of the largest manufacturing and research organizations in the air conditioning field, has a maximum static pressure efficiency of 15% in the useful operating range—requiring three times as much power as Hold-Heet to give less output.

5. Oversize Filter Area.

Hold-Heet supplies 2400 sq. in. Compare this with the competitor who claims the 1200 sq. in. employed in his units is 50% greater than is usually found on units of comparable size. Filter resistance varies with the square of the velocity. 2000 c. f. m. through 1200 square inches would have a pressure drop of .08 inch. This same volume has a pressure drop of only .02 inches (one-fourth as much) through the 2400 square inches of filter area Hold-Heet employs. Reduced power requirements and minimum operating expenses are thereby obtained.

6. Free Gravity Circulation.

It is vitally necessary that all furnaces employing solid fuel should have free gravity circulation or the heating plant may be ruined through overheating when the blower is not running. Hold-Heet insures free gravity circulation by oversize filter area, direct air passage, large port area, combined with a type of blower blade that does not obstruct the free passage of the air. The Hold-Heet blower does not need to operate continuously to prevent furnace overheating. Much of the heat is distributed by gravity circulation so that the electric current bill is kept at a minimum.

7. Low Installation Costs.

No sub-base is required, no expensive hood, no canvas connections. Hold-Heet saves on initial cost, on installation cost, and on operating cost. The unit is fully assembled when received. Dealers figure 4 hours installation time on the average Hold-Heet job, compared with 2 days on competing units.

8. One Standardized Unit

takes care of the 10-room house or the small bungalow. Simply adjust the 100-speed control to the output the job requires. Only one unit to stock—Only one unit to sell—Concentrate on Hold-Heet.

Repeat Sales Have Built Hold-Heet's Tremendous Volume

YOU ARE LOSING MONEY

If you do not have one of these new units which you can demonstrate. The quality and appearance is so striking, and the performance features are so outstanding, the demonstration you can make is so compelling that countless prospects would buy NOW if they could actually see the unit in operation. Order your demonstrator now.

a Big Unit

Do not confuse this ample size, ample capacity Conditioner (in heavy gauge steel, round-cornered gray enamel cabinet—52 inches high, 28 inches wide and 31 inches deep) with the ordinary, diminutive, under-filtered, high resistance units offered by competitors with the claim that they are "just as good." Such units are more nearly comparable with the Hold-Heet Booster Unit that has a Dealer Price of $29.75 complete with 1,000 sq. in. of Filters, Fan Switch and 100-speed control.

Hold-Heet BF 1 [Formerly ACA 1] Air Conditioner

This unit is supplied complete—assembled in 28″x31″x52″ heavy rigid steel cabinet with attractive gray enamel finish. 1/6 h.p. Ballentine Capacitor Motor with direct-connected 23″ Planoidal Blower, four 20″x30″ Hold-Heet Filters, Hold-Heet rod and tube type Fan-Switch, Control Box with 100-speed control—All for dealer cost of **$50.50**

Free!

New Blower and Filter Sales and Engineering Manual and Catalog

Giving:

Easy way to sell Blower Jobs.

3 Easy ways to figure and check any job.

Tells how to install, with diagrams for COAL, OIL and GAS burners. Where a Booster Unit can be recommended, etc., etc.

Invaluable information for every Furnace Man, regardless of what line he sells.

This Coupon Will Bring You a Real Money Making Opportunity—Pin It to Your Letterhead

RUSSELL ELECTRIC COMPANY
342 West Huron Street, Chicago, U. S. A.

Send Free

*Note: Only supplied when your regular business letterhead or a full explanation shows you are entitled thereto.

- ☐ **Blower Sales Manual and Catalog.**
- *☐ **Dealer Price List.**
- *☐ **Set of 3 Large Photographs.**

Send to .....

Name of Firm .....

Address .....

City ..... State .....

Name of Preferred Jobber .....

RUSSELL ELECTRIC CO., *Mfrs.* 342 West Huron Street Chicago U. S. A.

In This Issue

The field of metal fabrication and cooling for restaurants seems to be increasingly attractive. In Cleveland, the Cutter company has developed units highly satisfactory to local users and has built up quite a business. On page 12 we give some interesting facts on the operations.

*

We continue to baffle cast iron, top radiator, round cased furnaces on page 14. If we have omitted a baffling method you have found practical, send us a sketch and explanation.

*

About once each month we receive a letter from some reader asking where he can get information on making metal boats. On page 15 we explain how a California reader has sold enough boats to keep him busy all winter.

*

The series on fan-furnace heating for large buildings continues on page 20. This article explains how fans are designated and how they are rated.

*

We understand that many readers and associations have written Minneapolis authorities for information on the code we are publishing monthly. If we can answer questions write us.

*

If you like to work cross word puzzles turn to page 54. Here's a puzzle based on our own industry. The solution will appear next month.

*

About this time every year contractors get called out of bed to remedy moisture condensation troubles. In December, 1934, we published an article showing what types of fuel make condensation. On page 27 we give further information by the same author.

*

S. Konzo continues on page 28 his informative discussion on pressure losses in forced air jobs. This article tells you just where losses occur and how great these losses are.

*

In large building work we often have the c. f. m. specified. We then have to establish the register temperature. On page 32 the formulas required are all presented for your notebook.

*

Quite a bit of discussion has been under way in the last year on the effect of different types of registers on the flow of air into a room. The best article we have ever seen on this subject based upon excellent tests is published on page 33. We strongly recommend your careful study of the text and the drawings which show just what happens to an air stream.

AMERICAN ARTISAN

With which is merged

FURNACES AND SHEET METALS AND Warm-Air Heating

Covering All Activities in

Gravity Warm Air Heating — Forced Warm Air Heating
Sheet Metal Contracting — Ventilating
Air Conditioning

J. D. Wilder, Editor

Vol. 104, No. 12 **December, 1935** **Founded 1880**

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More than 7,000 Copies of this Issue are being distributed

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THIS 60-year-old house in Passaic, New Jersey, proves again the durability of copper sheet metal work. The copper gutters have served for 60 years. During that period, twelve sets of ordinary leaders rusted away!

Copper assures the home-owner better value ...complete freedom from all repair expense due to rust. That's one reason why it's easier to sell Anaconda Copper. Another reason is the general acceptance of this brand as the standard of sheet metal quality. Leading sheet metal supply houses carry Anaconda Copper in sheets and rolls, and copper gutters, leaders, elbows and shoes trade-marked ANACONDA.

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MANUFACTURERS OF

PEERLESS WARM AIR FURNACES

STOVE AND FURNACE REPAIRS

1845-1935 LUDLOW AVENUE

INDIANAPOLIS, INDIANA

December 11th, 1935

To the Warm Air Furnace Dealers of America:

The Rush is over, and we want you to know how much we appreciate the patience you displayed in waiting for delayed shipments. The abundance of orders received certainly expressed your goodwill and confidence.

Every department was operating to capacity, and manned by the best mechanics securable to produce for you fine merchandise as quickly as possible. But still we fell behind in our shipments.

We are now back on our regular shipping basis, and can again serve you promptly. During 1936 we will add additional equipment to assure you prompt deliveries.

We take this opportunity to extend heartiest Season's Greetings, and again thank you for the splendid co-operation you have given us. Serving you has been a pleasure, and we hope that the coming year will be a successful and profitable one for you all.

THE PEERLESS FOUNDRY CO., INC.

J. R. Strahlendorf

PEERLESS BOILER IRON FURNACES

Peerless Furnaces Make Warm Homes

For Heating, Ventilating, Air Conditioning-
AMERICAN STEEL SHEETS

MANY of the advancements of modern construction and equipment would be either more difficult and costly, or actually impossible without the use of SHEET STEEL. Air-conditioning is one such development, added to already large uses for heating and ventilating installations.

Other extended uses for sheet metals include roofing, siding, cornices, skylights, door frames, metal lath, window frames, panel sheets, material for mouldings, trim, ducts, and similar uses. This Company offers high grade sheets and light plates of dimensions, gauges and finishes adapted to different requirements and for all known uses. Supplied in Black and Galvanized Sheets, KEYSTONE Copper Steel Sheets, Sheets for Special Purposes, Tin and Terne Plates; U S S High Tensile Steel Sheets, and U S S STAINLESS Steel Sheets. Write for full information.

AMERICAN SHEET AND TIN PLATE COMPANY, Pittsburgh, Pa.

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is added *deliberately*

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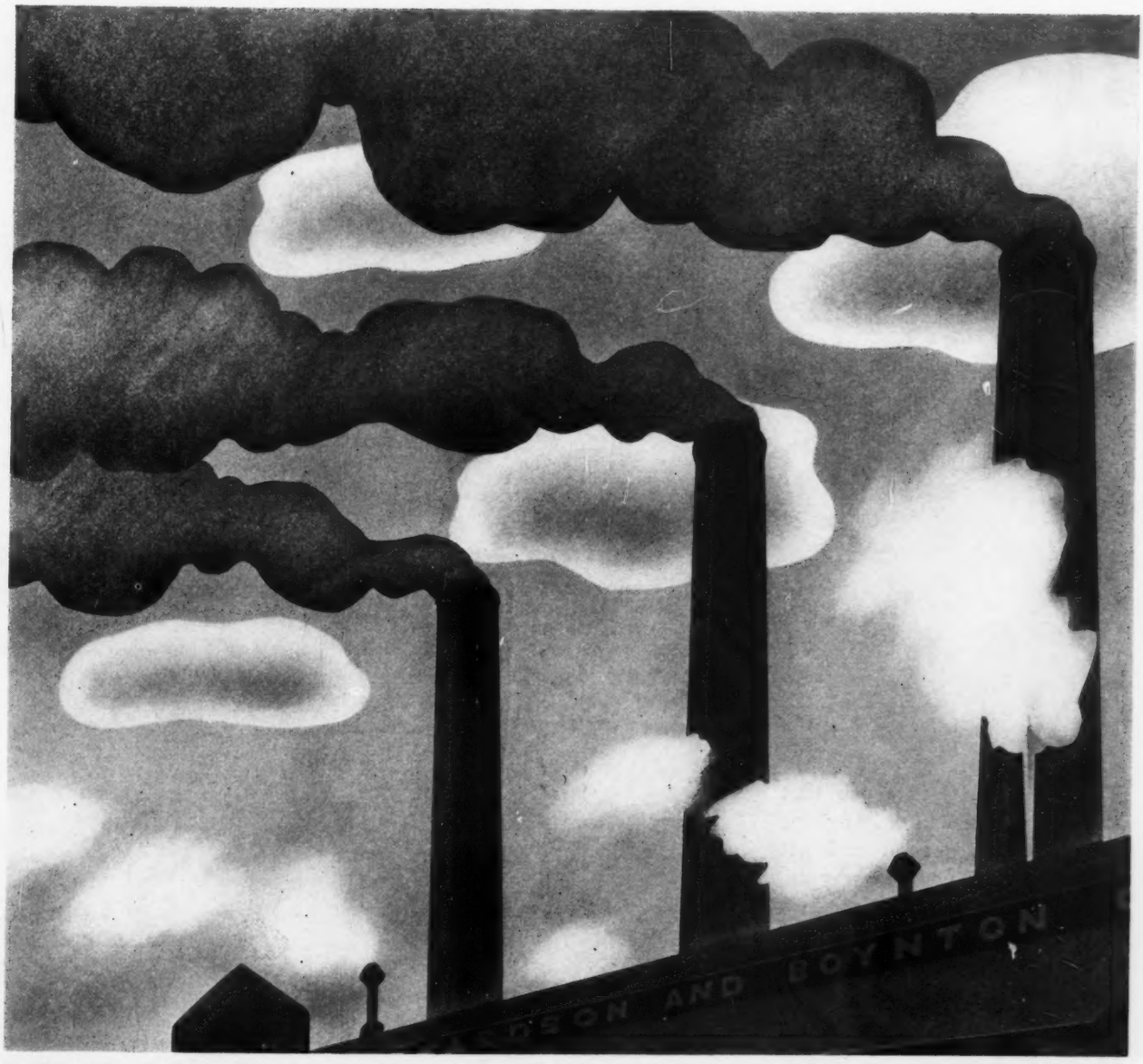
GOHI

GOHI Pure Iron-Copper Alloy is available in all sizes and gauges. Produced exclusively by The Newport Rolling Mill Company, Newport, Kentucky.

PRONOUNCED "GO-HIGH"

SHEET METAL

THE NEWPORT ROLLING MILL COMPANY . . . NEWPORT, KENTUCKY



FULL BLAST

The clouds are disappearing. Blotted out by belching smoke. For instance, in the Richardson & Boynton plants where everything is bustling activity as an avalanche of orders is being filled.

These orders come from experienced contractors, jobbers and dealers—men who know the worth of R. & B. heating units—men who know the value of R. & B. cooperation—men who know that Richardson & Boynton will back them to the limit.

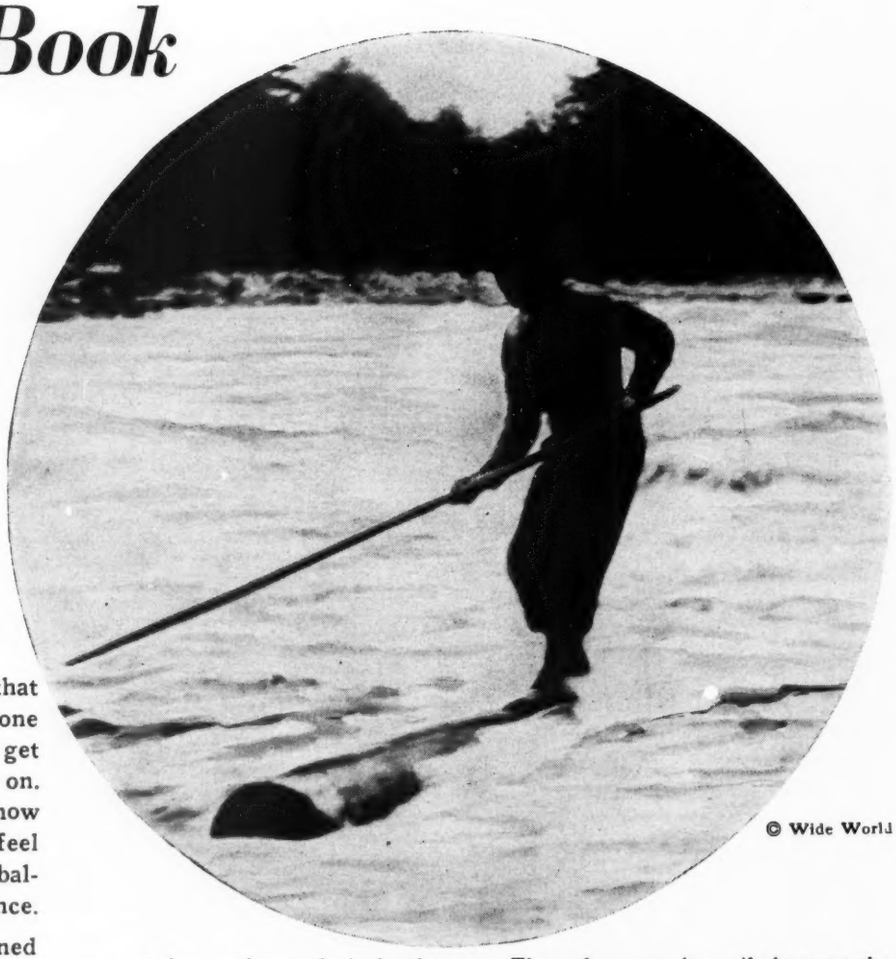
During the slack years Richardson & Boynton looked ahead—not back. As a result, today finds us with plans for new improvements, innovations in heating and air-conditioning on the drafting boards. As soon as they meet the rigid tests of quality and performance in R. & B. laboratories, they will be offered to the public.

In the meantime, Richardson & Boynton are going ahead to fill the promising needs of today —full blast!!

RICHARDSON and BOYNTON Co.

244 Madison Avenue, New York City. Branch Offices in Principal Cities.

He didn't learn this *from a Book*



© Wide World

LOG-RIDING is a job that can be learned only by one method. You get on and get "ducked" until you can stay on. No book tells the lumberjack how to escape the duckings. The feel of a log and a hair-trigger balance come only with experience.

Most every job must be learned by the hard method of experience. Yours is no exception, nor is ours. To make screws that consistently save time and labor on sheet metal assembly work requires more than wire, machines and a book of rules. It takes EXPERIENCE. Because Parker-Kalon possesses more than 20 years of it, genuine Sheet Metal Screws give *uniformly perfect results* in contrast to the uncertain action of imitations which may "look" just as good.

This uniformly perfect action assures consistent savings of assembly time and labor. That's why it will pay you to specify and insist upon Parker-Kalon Sheet Metal Screws.

Genuine Sheet Metal Screws guarantee assembly economy!

They *always hold* because the threads run full diameter right to the head. They *always go in easily* because the threads are designed with expert knowledge of the work they must perform and held to a high degree of uniformity. *Their threads don't strip, nor do the heads twist off* because they are made from a special analysis wire and are hardened by an exclusive process developed from 20 years' experience in making Parker-Kalon Self-tapping Screws.

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PARKER-KALON CORPORATION
190 Varick Street New York

PARKER-KALON
HARDENED TYPE A SELF-TAPPING
Sheet Metal Screws
PATENTED NO. 1465148

PARKER-KALON PRODUCTS ARE SOLD ONLY BY RECOGNIZED DISTRIBUTORS

AMERICAN ARTISAN

Volume 104 Number 12

A 1935 Inventory

AS THIS ISSUE of AMERICAN ARTISAN goes into the mails, contractors all over the country will be pausing to take stock of 1935.

By and large 1935 has been a pretty good year. Business for us began to pick up early last winter, continued good all through the summer, developed into a mighty good fall and winter.

Reports coming in from practically every state and from large cities and small towns indicate that work was let to contract all year long. Heating work seemed to head the list, but roofing, sheet metal, ventilating, industrial contracts of all sizes and kinds brought increased activity to practically every type of operator.

It has been interesting to note how the various activities covered by our industry felt this business revival.

Warm air heating has shown some highly interesting changes. According to surveys made by outside agencies, nine out of every ten expensive ($15,000 up) homes built this year specified air conditioning. Out of the nine wanting air conditioning 60 per cent of the owners definitely specified some form of forced warm air, air conditioning. When we look back five or ten years we can appreciate how remarkable is this change of attitude of large home owners. It means, we think, that warm air heating has graduated from the poorly considered class to the class of accepted heating for the most expensive type of structure.

All types of warm air heat have felt the stimulus of more business. It is not unreasonable to state that 1935 business has been at least 35 per cent better than 1934, which was at least 30 per cent better than 1933. Sales of furnaces have really begun to climb to pre-depression figures.

Sales of accessories needed to convert gravity warm air heating to forced air and air conditioning have increased by leaps and bounds. In 1935 it is not unreasonable to say that at least 40 per cent of all furnaces sold had a fan or blower, filters, an automatic humidifier, automatic controls, square casing, washers, etc. The percentage of accessories to furnaces has increased steadily all year long.

Sheet metal contracting (architectural) by comparison with 1934 and 1933 has had a good year. In some parts of the country government impetus has brought to contract numerous public and semi-public buildings requiring large quantities of materials. Remodeling of old buildings, betterment of interiors, new fronts, introduction of new types of structures such as the one-story taxpayers have boosted the volume of work.

Right along with outside metal work, roofing has expanded tremendously. Government buildings and government money have made it possible for municipalities and industry to modernize and build needed structures. At the same time a large volume of repair and renewal has kept shops everywhere busy.

It is almost impossible to calculate the progress made by air conditioning. Everywhere stores, factories, homes, buildings, restaurants, shops have turned to air conditioning as a positive entree to more business. Every such installation has meant work for our trade. Tens of thousands of tons of materials have been required and shops of all types have been able to secure some of this work.

It would be unwise in any inventory to overlook some of the difficulties which may become real problems next year.

There has been this year and will be next year the problem of mechanics. In dozens of active towns it has been impossible to get good mechanics this year. Some former mechanics have gone to other industries, where wages may be lower, but work steadier. Until business comes back in a predictable volume these mechanics will not be available.

In the last five years the industry has practically abandoned the training of apprentices. Today we have few young men ready to step into the vacancies and two or three years will be needed to train them.

Wage rates have been this year and will be next year a stumbling block. In some towns the wage rate for union labor is far too high. In other towns it is too low. In some towns the union scale governs the going rate for the industry—in others union wages are not a factor. Mechanics will tend to migrate from low wage towns to high wage towns, thus further complicating the labor problem. Wage agreements have proved to be knotty problems and will likely continue so for several years.

With the abandoning of codes, we have had the return of practically all the sharp practices formerly troubling the industry. Roofers are back in their old fight about poor materials and long guarantees. Operators in many communities are feeling the effect of low prices, which increased volume will eliminate. Absence of essential experience is tending to reduce prices below their justifiable level in some localities.

New materials, new methods, increased competition slow in getting under way during the last four years is again getting set to do battle. We will have to adopt, remove or nullify their effects during the next few years.

1935 has been a good year.

1936 looks brightly promising.

Cutter Sheet Metal Mfg. Co., Cleveland, Finds Restaurant Work Profitable

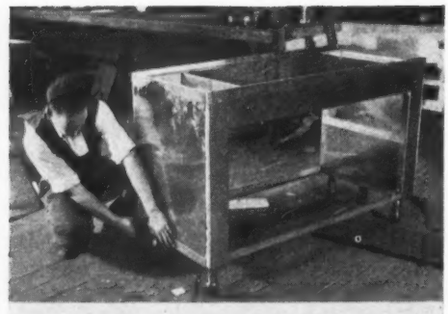
IN the city of Cleveland, there has developed in the past three or four years an interesting modernization movement among restaurant owners. Cooling to hold the summer trade began about four years ago. This was followed by a general trend to inside remodeling and alteration to make interiors as attractive and pleasant as possible. As has been the case in other cities, this modernization was instigated first by two or three owners, followed by others not so progressive, but compelled to follow suit.

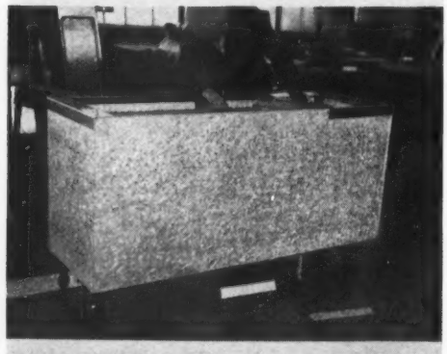
In Cleveland the Clover Coffee Shoppes, Inc., the Clark chain of restaurants, Gazelle company were leaders. In the restaurants operated by these owners, cooling for summer comfort began several years ago. Interior remodeling followed soon, taking the form of bright, clean, modern fixtures, better to display the food and make secure old and new patronage.

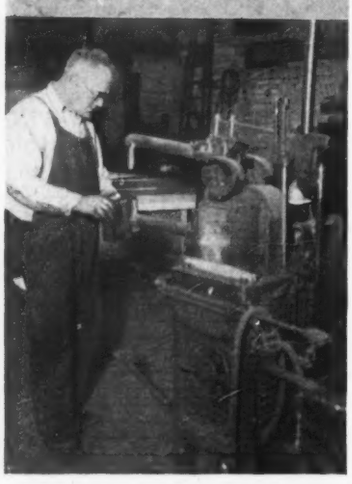
The result of cooling, air conditioning and interior modernization can be briefly stated in the words of George Jacobs of the Clover Coffee Shoppes:

"The problem of the restaurant owner is, if anything, acute competition. Eating habits are strange things. Downtown restaurant owners have three sources of trade—working women, working men and shoppers. Rarely is it possible for any owner to hold all three classes of trade in the same establishment. The owner may attract the working women and the shoppers (mostly women), but if a restaurant caters to a predominantly woman trade it is hard to hold the men. The reverse is also true. One may be sure that any restaurant well patronized by all three classes of trade is offering exceptional food and service.

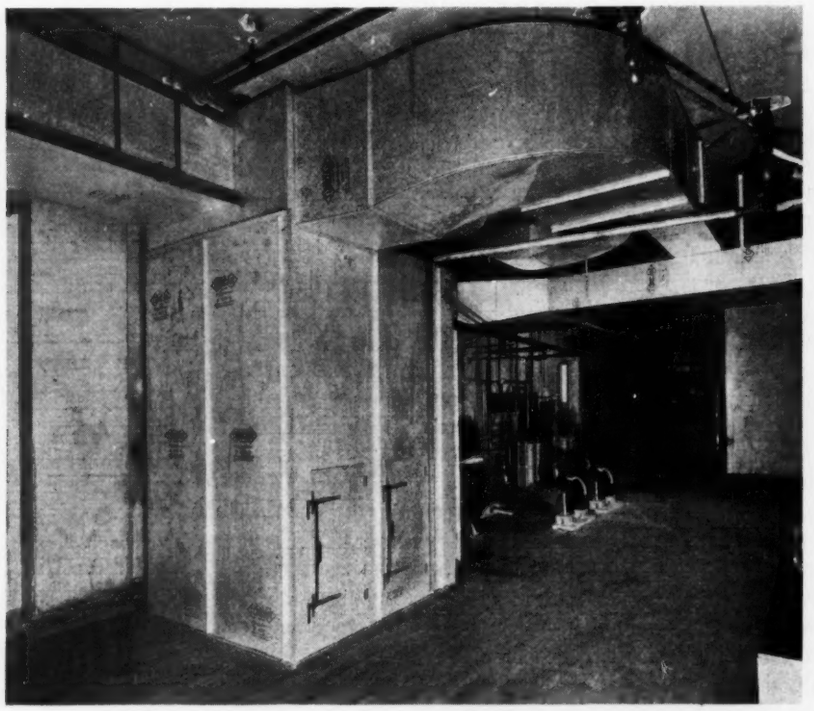
"We adopted summer cooling because we wanted our profits to hold up during the hot days of summer.







Units in production in the Cutter shop. From the top down—Putting a stainless steel end on a cooling cabinet. Note pipe legs, ball feet, angle iron frame. Second—Unit for counter showing the galvanized iron back and ends and stainless steel top trim. Third—A short order range assembled ready for the gas burner, drawers, doors and legs. Bottom—Operator spot welding a small drawer for one of the cabinets.



This large cooling system was installed by the Cutter company in Bomontis—one of the first cooled restaurants in Cleveland; also one of the largest restaurant installations.

Before we installed cooling I could take a graph of our daily summer sales and tell you within a fraction of a degree of accuracy what kind of weather we had on any one day. As heat and humidity rose our sales fell off and we were swamped for certain types of hot weather dishes. Since we installed cooling I cannot do this because a cool restaurant increases the sales check and tends to wipe out the rush for hot weather dishes. Further, I can compare two of our restaurants—one cooled and the other not cooled and show how cooling increases the total number of sales and the total of each check by a very predictable amount.

"Cooling and air conditioning not only increase sales and increases the variety of the orders, but it also attracts to the cooled restaurant new trade and holds patronage. Of course, as more and more restaurants are cooled, the endeavor to hold patronage must be based upon other things, such as good food, attractive menus, pleasant surroundings, good service. It is to insure these appeals that we remodel and modernize our interiors, make the display of food as attractive as possible, make sparkling cleanliness a part of our service.

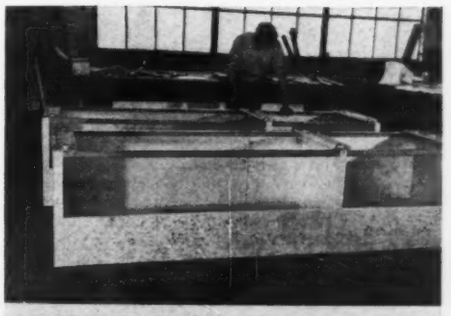
"We have found that the installation of cooling and air conditioning brings about many changes we did not anticipate before cooling was installed. Our help, for instance, is able to maintain a pleasant temper, equipment breakage is greatly reduced; patrons are less mentally explosive; and the food not only tastes better but is better. Also, we are able to offer a more varied menu, with some assurance of sales in items on which there is a profit, but which might not appeal in a hot, muggy atmosphere."

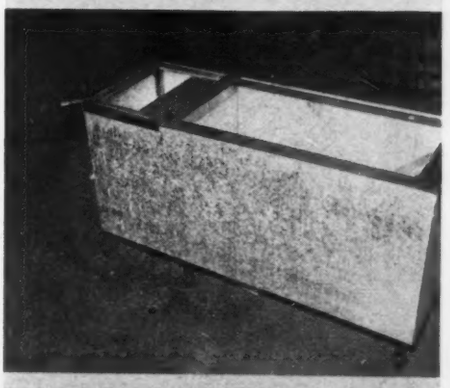
This trend toward cooling, air conditioning and modernization has, naturally, meant work for the contractors of Cleveland. Of the several firms qualified to install air conditioning and fabricate the new fixtures, the Cutter Sheet Metal Manufacturing Company, Inc., has been one of the leaders. So attractive has the Cutter Company found this type of work that shop and field practices have been perfected to produce and install just the type of equipment demanded by Cleveland restaurant operators.

Some of the best known restaurant cooling systems in Cleveland were installed by Cutter. These range from comparatively small systems to the multi-ton installations of the large establishments.

The Cutter Company has an

(*Continued on page* 68)

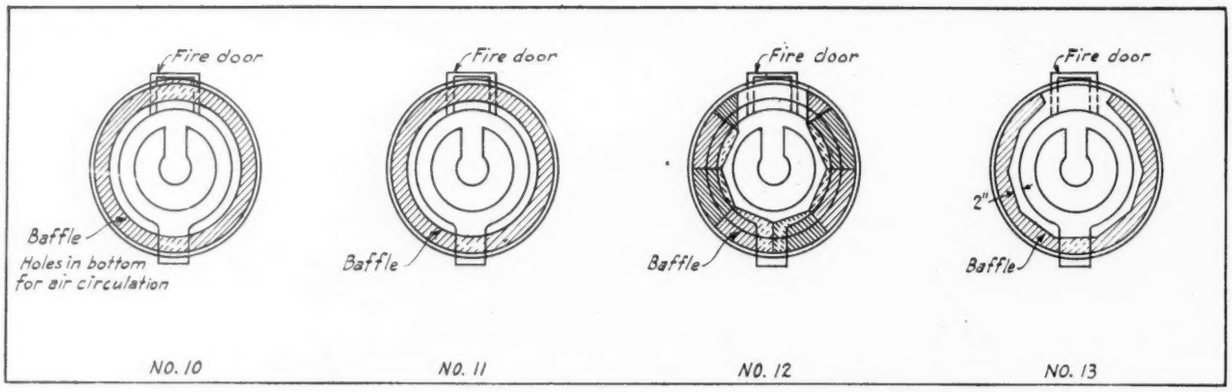




The end of the cafeteria counter in the Pickwick Coffee Shop—showing also a serving counter and at the right the end of the coffee counter. Stainless steel tops, micarta panels made to Cutter specifications.

More units for a Clark restaurant. From the top down—A large counter section (steam table) turned upside down for attaching legs. Second—Looking down into a cool dish cabinet. This is cork lined and stainless trimmed. Third—A stainless steel topped silver washing cabinet. Though the picture does not show detail clearly, the corners of this type of top are a feature. Bottom—Restaurant order receiving finishing touches.

AMERICAN ARTISAN DATA SHEETS



Some Suggested Baffling Practices

Whenever a gravity furnace is converted to forced air, we should baffle the casing to insure that the faster moving air will impinge on the hot surfaces. If some air goes by without picking up heat, we have trouble. Here are several baffles for top radiator, cast iron furnace.

THE articles previously published on baffling round casings for steel and cast iron furnaces when converting a gravity installation to forced air have brought out the fact that the industry has developed numerous types of baffles. Some of these baffles are entirely ingenious—some are decidedly economical of material and labor and several are outstanding in their ease of fabrication and installation.

This article concludes the types of baffles used for top radiator, cast iron furnaces with round casings. The first articles covered round cased steel furnaces. If we have omitted any type of baffle in use and proved satisfactory, we invite description.

The five types described in this article differ in construction, if not in type, from those of the November and October issues. The reasons behind these types are best explained by their sponsors. They say:

Number 10

W. J. Kollas, Engineer, Montag Stove & Furnace Works, Portland, Ore.

Figures 10 and 10A show the method we use for baffling round casings when converting cast iron, gravity furnaces to forced air. We prefer straight bonnets because of the ease with which leads or trunks may be taken off and also because a large plenum or mixing chamber is gained by extending the casing higher. We recommend black iron for the baffles for its heat transmitting qualities. Where a high bonnet cannot be used we place a cone shaped baffle above the radiator with a hole in the center of such size that the air velocity through the hole is approximately 400 feet per minute.

The free area between the baffle and the prime heating surface is based on an air velocity of approximately 400 to 500 feet per minute. We cut holes through the bottom of the box baffle to permit air circulation within the baffle box. Ordinarily the bottom of the baffle box is located at grate level or about 14 inches above the floor.

Number 11

R. M. Cook, Engineer, The Thatcher Co., Newark, N. J.

The two things that determine our method of baffling are efficiency and cost. We cannot sacrifice either one or the other. The baffle or inner casing that we use on our forced air installations is a plain galvanized two-piece circular casing which runs the full height of the furnace. (Figs. 11 and 11A.) This casing has a 2-inch clearance around the radiator and is cut out to go over the extension on the ash pit and the combustion chamber. We connect directly from the blower through the outer casing to the inside baffle, as shown on the sketch. On the top of the inner casing, we use a round to square transition to which the installer connects the plenum chamber. We do not put any small holes through

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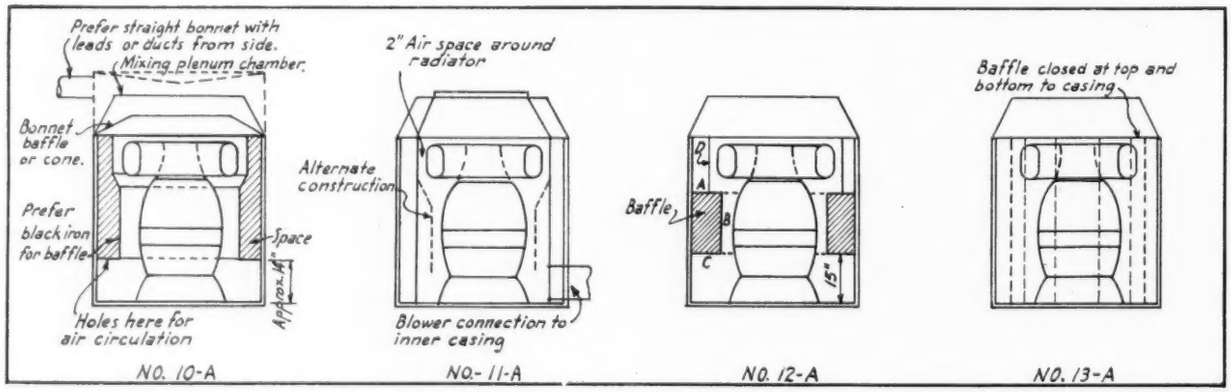


Looking for a Specialty?

John L. Watson, Glendale, Calif., Has Boat Orders to Keep Him Busy All Winter

By John J. Stapp

IF you are looking for an article to keep your shop busy during the slow winter months, John L. Watson, of Co-operative Sheet Metal Works, Glendale, California suggests metal boats. Last winter he started turning out boats of 26-gauge iron, just to keep his shop busy. This winter he has a stack of about a hundred orders.

Not only have boats developed into a profitable side-line for the Co-operative Sheet Metal Works, but they have proved to be a real lead to all kinds of customers, from sporting goods houses to private homes. A number of wholesale and retail sales made by Co-operative have been first contacts with new customers that could have been reached only at considerable expenditure. Thus, an expanding sheet metal business is a secondary result of Watson's boat selling campaign.

The boats are wholesaled at twenty dollars each, and are unpainted when wholesaled. Since most wholesale customers buy several boats, and also represent a replacement market for future sales, this end of the business is more profitable than the retail end. The wholesale market is wide; here is a partial list found by Watson: Resorts, fishing lodges, hunting lodges, private clubs, sporting goods stores, hardware stores, department stores —sporting goods departments, boat supply houses.

Various Uses

The boats can be used for either hunting or pleasure and their sturdy iron construction makes them more attractive to buyers than ordinary boats. They are constructed to hold one person, a cockpit just large enough to slide into being built at the center of an enclosed, all-metal unit with a "waist" built up around the opening to protect the user from wave-slap. Since the hollow construction is very buoyant, it rides the wave crests easily, even on a fairly rough swell.

Tests were conducted to arrive at a salable product that would perform under adverse conditions, as it was necessary to produce an article that would hold up well during cold duck-hunting seasons, heavy water in the spring freshets, etc. There is a year-around demand for boats; when one boating season is over another is "in" to take its place and sportsmen are finding a Co-operative-built boat adds zest to their sports.

That is the best advertising, Watson asserts. One buyer will recommend another. Demonstrations at the hunting and fishing clubs, resorts, etc., bring orders from that field. To further retail sales, Watson uses a clever display in front of his establishment. One of his boats is hung between two towers, the higher one having a windmill atop it. This is a miniature replica of his boat, with a "sheet metal man" sitting in it and a wind wheel at the front to keep it whirling on a swiveled base.

The photographs on this page and the detail drawing opposite show the general appearance of the lead roof and details of the lead application. Note that pan sheets are practically all of a size while similar labor saving was used for caps, flashings, etc.

The Hard Lead Roof at Saratoga Spa

SARATOGA SPA, at Saratoga Springs, N. Y., owned by the State of New York and operated by it through the Saratoga Springs Authority, is a complete plant providing baths, drink hall, research laboratory, recreational facilities and hotel, all designed so that the curative naturally carbonated mineral waters of Saratoga Springs may be scientifically administered under the most favorable conditions.

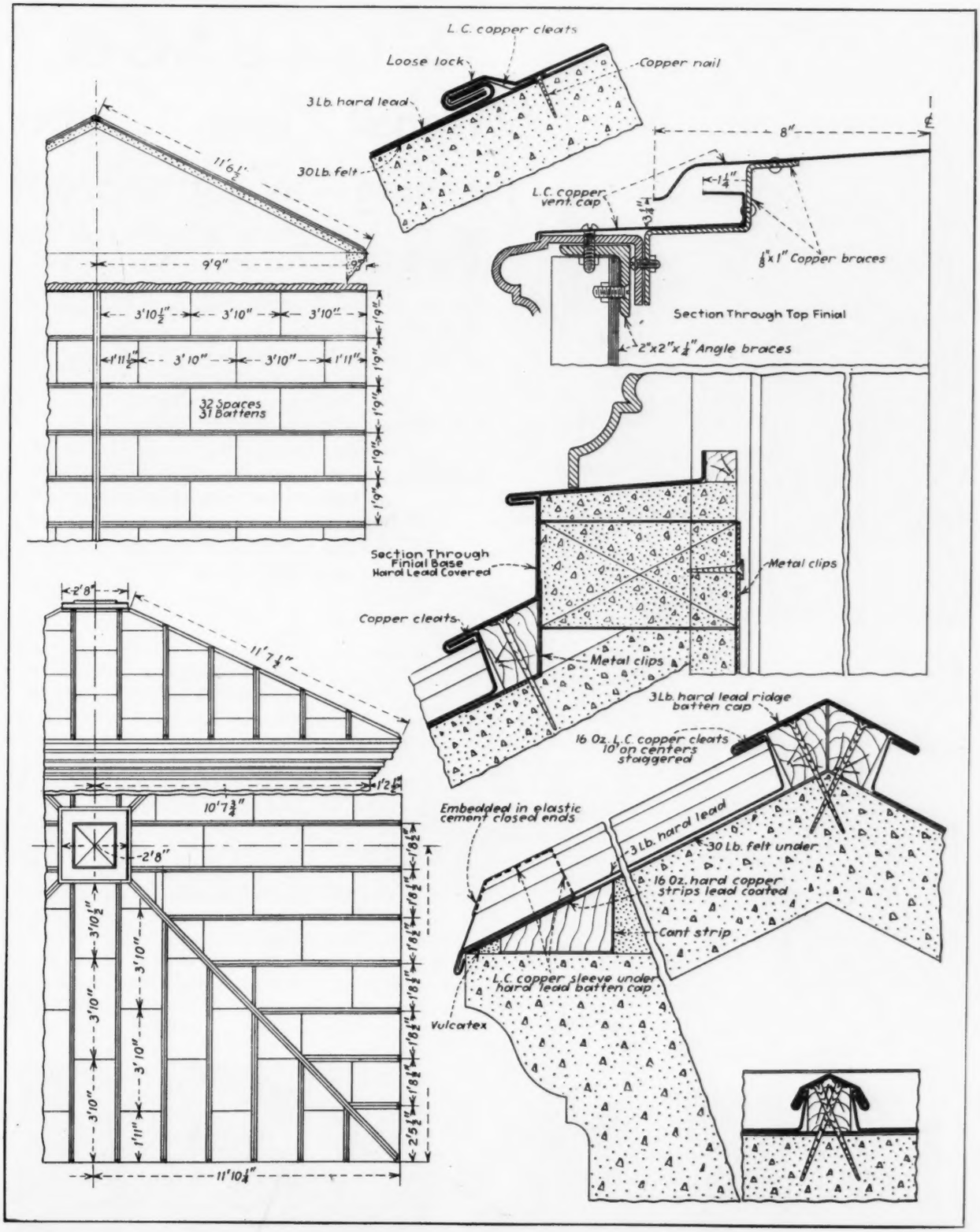
The waters of Saratoga Springs are the only naturally carbonated mineral waters known to exist east of the Rockies in this country. The State owns 163 springs in the area, but all but 19 have been shut off in order to control the flow. Of these 19, the waters of three are bottled, while six of the others are used for the baths, and the remainder flow free for springside drinking or to demonstrate the pressure of the carbon dioxide gas that sends the water high into the air.

The buildings are Georgian in character, the principal construction materials being red brick, limestone, marble, slate and lead. The pavilions and arcades which stretch out from the Administration Building, Drink Hall and East and West Baths and provide covered promenades are roofed with hard lead sheets. These buildings were designated by Joseph H. Freedlander, of New York City. The sheet lead work was performed by Bushwick Cornice Works, Sobel and Kraus, and Supreme Sheet Metal Works and Roofing Company, J. J. Fisher Co., all of New York. R. V. O'Brien is chief engineer of the Saratoga Springs Authority, the State body in charge of the Spa.

Lead was selected as a material which is durable, has considerable thickness and its color blends readily with other materials.

The lead roofs at Saratoga Spa are 3-pound hard lead, installed with wood battens 21 inches apart and laid over pre-cast gypsum roof decks and a layer of 30 pound roofing felt. All seams are loose-locked and filled with Vulcatex non-hardening compound. The lead is held in place by lead-coated copper cleats folded into the joints. Thus free movement of the lead resulting from expansion and contraction is permitted in all directions, yet the roof is securely fastened in place. At the eaves a continuous strip of 16 ounce lead-coated copper embedded in Vulcatex was installed under the battens and the lead roof pans were hooked over the edge of this strip to form a drip.

Batten ends were closed at this point by inserting a lead-coated copper sleeve about 4 inches long over each and soldering a piece of lead to this sleeve over the end of



the batten. This piece of lead was large enough to hook over the edge strip at the bottom. The lower ends of the roof pan upstands were beaten slightly around over this end piece and the lower end of the batten cap likewise turned down over it. At the hips and ridges, ridge battens were installed and roofing sheets turned up against them with corners folded and soldered. Ridge and hip batten caps were loose-locked to the upstand of the roofing sheets and to the upper end of batten caps.

Virtually the same method was used in the center of pavilions where the roof finished with cast lead finials. Sheet lead at the base of the finial was joined to roofing and batten caps in the same way as ridge batten caps and the cast hard lead finial, supported internally by 2 by 2 by ¼ inch angle braces, was installed over sheet lead which was run back under the base to prevent leakage.

Tile Laid in Mortar, Asphalt Plank, Copper Flashing—Weatherproof Toledo Y. M. C. A.

This roofing installation has several interesting features—The cover tile are laid in mortar, tile are carried across gutters, one flat roof is covered with asphalt plank for sun bathing — to mention a few details. Our photographs and the text explain the reasons and application.

IN Toledo, Ohio, the Y. M. C. A. is now completing a new downtown building, designed in the Mission style of architecture and embodying in its construction the best of modern style and craftsmanship. One of the prominent features of the building, both from an architectural and construction standpoint, is the roof—composed of heavy tile and flashed and insulated by the most approved methods. The installing contractor is Warneke Brothers Company of Toledo.

The building consists of several flat decks and roofs; also several small towers and "L's," each covered with tile or heavy built-up roofing. Altogether some 105 squares of tile and 132 squares of built-up roofing were used on the building. The tile color is an autumn red and russet with enough scattered off shades to give contrast.

The roof under the tile is wood sheathing insulated by 2 inches of cork. The cork is water-proofed with hot mopped, 30-pound felt. The style of tile used is Roman, with 12 by 12 pan tile. The cover tile are 12 inches long laid with 10 inches exposed to the weather. The rafters used are standard 1 by 2⅝-inch. No eave closures were used, but top fixtures were used along parapet walls, ridges and hips. (See photographs.)

The tile were nailed with copper nails in accordance with customary practice, but also all covers were laid in a full bed of cement as can be seen by the photographs, thereby increasing the water-tightness of the roof and eliminating all possible loosening of any tile.

An interesting gutter appears around the "L's" (shown in two of the photographs). This gutter is built from a 48-inch sheet of copper which begins at the outer face of the brick work of the wall, covers the wall under the tile, forms a deep box gutter and extends up the roof under the tile for a distance of 10 inches. In addition to nailing and

Closeup of a roof showing type of copper gutter, wall and ridge flashing and tile.

Looking down on a small roof showing the cover tile laid in mortar and the type of flashing used.

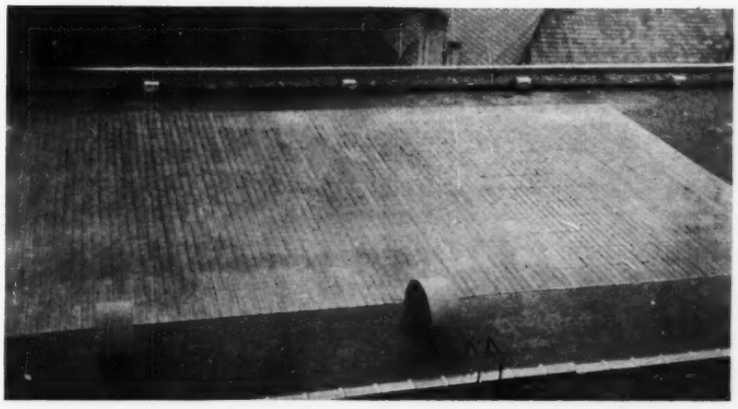
The two photographs above show closeup views of the tile laid on one of the main wings. Attention is called to the boxed butter with tile carried over and wired. The pictures also show the mortar bed for the cover tile.

cementing the tile, the course of tile which crosses over the gutter is wired into the roof for additional safety. The covers of the bottom course of tile are also wired to the pan tile for safety. Standard hip rolls and ridge tile were used, but again these covers were all cemented in place.

Color Selection

In order to control the color variation of the tile, each car of tile was divided into several piles at the freight yards. Then as the trucks were loaded for the job, each load was taken from several piles. At the job the truck load of tile were again stacked in several piles and when the ground man sent up a load of tile he made up the load from several ground piles. Thus the tile was shuffled several times and only rarely did the top men have to make a definite arrangement of colors.

The flat decks and roofs are all covered with a bonded roof—either 15 or 20-year guarantee felt and asphalt hot mopped onto the 2-inch cork insulation layer. Gravel is used as a cover. One of the photographs shows the largest flat roof with its partial covering of asphalt plank. Some 3,000 square feet of this plank were laid in the asphalt. The durable surface thus formed will be used for sun bathing and is strong enough not to be disturbed or scuffed by traffic, chairs, cots, etc.



Above—View of a large flat roof covered with asphalt plank for sun bathing.

Around all flat decks a copper cap flashing is carried down over the roofing felt which is carried up over a cant strip. Column stubs are covered with copper caps and flashings which are turned up inside the wall.

Several hundred feet of flashing were used on the building. Around the flat decks the built-up roofing was turned up the wall over a cant strip and a copper cap flashing was placed over the built-up roofing edge. Around the tile roofs a two-piece copper flashing was used as shown in the photograph. In all cases the cap flashing is carried into the wall 4 inches and turned up 1 inch in a mortar joint. Along tile roofs the base flashing was bent slightly along the edge for additional stiffness. Under all coping caps a full wall thickness of through-wall flashing was installed to eliminate any possible seepage of water into the brick walls and parapets. Around the central court a type of hanging gutter shown in a photograph was used.

The Warm Air-Fan System of Heating and Ventilating for Large Buildings

By Platte Overton
Consulting Engineer

This second article in the series covering design of fan-furnace systems for large buildings deals with the selection of proper fans and blowers. The author explains how fans are designated, what is meant by common fan terminology. He also presents a few needed formulas on which fan laws are based.

FANS used in connection with direct fired heaters should have the discharge opening as low and wide as possible. Air openings into the heater casings at the rear or sides should not exceed 36 inches in height and 30 inches is much better.

If we have designed a system that requires 18,000 c.f.m. at 2,000 feet per minute outlet velocity at the fan discharge, we will require a fan discharge of 9 square feet.

In most makes of fans the width of the discharge is much narrower than the height, and no doubt this 9 square foot would be from 24 to 30 inches wide and from 40 to 60 inches high. This, of course, is much too high for our requirements of 30 to 36 inches.

In various catalogs covering fans and blowers, it will be found that capacity tables for double inlet fans are not included. However, we simply divide the c.f.m. required by 2.

Example: We have a job which requires 18,000 c.f.m.—we divide 18,000 by 2, which equals 9,000, and we get our dimension from tables for a 9,000 c.f.m. fan. This means our height will be half of that for the single inlet fan and twice the width.

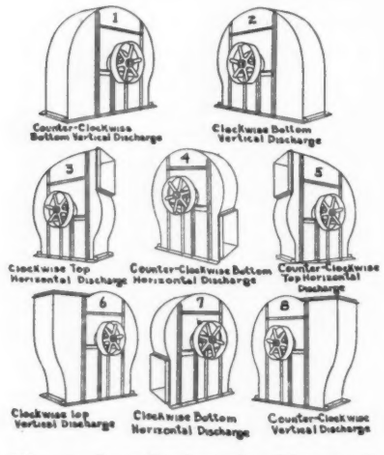


Fig. 1—In selecting the blower the contractor must tell just what type of discharge he needs. These units show the proper designation for discharge.

This gives us a much better application with a lower discharge dimension. The reader is advised to study fan catalogs for this information.

Where return air or outside air ducts are connected directly to the fan intake, double inlet fans are sometimes difficult to use as one inlet may be partially blocked by the fan pulley. In such cases it is customary to place the fan in a room and let the walls of the room act in the capacity of a fan housing.

Fan Designation

In Fig. 1 is illustrated the method for designating the discharge and rotation of centrifugal blowers. By indicating the arrangement and the figure of the fan at the time the order is placed, all possibility of error is overcome. This method of designation will apply to all centrifugal fans, single or double width, single or double inlet.

Facing the pulley or driving side of the fan: If the proper direction of rotation is clockwise, the fan is designated as "Clockwise." If the proper direction of rotation is counter clockwise, the designation will be "Counter Clockwise."

The discharge of a fan or blower will be determined by the direction of the line of air discharge and its relation to the fan shaft, as follows:

Bottom horizontal: If the line of air discharge is horizontal and below the shaft.

Top horizontal: If the line of discharge is above the shaft.

Down blast: If the line of air discharge is vertically down.

Fan Terminology

In discussing fans, we frequently use such expressions—"Outlet velocity," "Tip speed," "Revolutions per Minute," "Brake Horse Power" and "Efficiency."

Outlet velocity is, of course, the velocity at the discharge of the fan and we may calculate this velocity fairly accurately by dividing the c.f.m. by the area in square feet of the fan discharge.

Example: C.f.m. equals 16,000—Fan discharge is 4 feet wide by 2 feet and 6 inches high or 10 square feet. 16,000 divided by 10 is equal to 1600 or 1600 feet per minute outlet velocity.

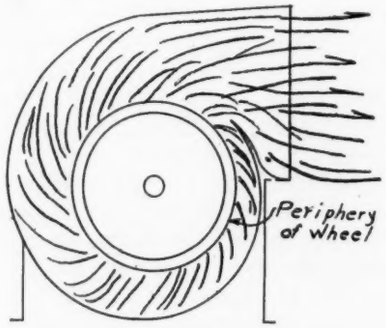


Fig. 2—"Tip Speed" is used in connection with noise and air delivery. The sketch shows just what is meant by the term and where it is measured.

Tip speed is the speed in feet per minute of the periphery or edge of the wheel (Fig. 2). We calculate the tip speed in feet per minute by multiplying the circumference of the wheels in feet by the R.P.M. (Revolutions per minute) of the wheel.

Example: Wheel is 30 inches in diameter—R.P.M. is 300. Tip speed equals: 2.5×3.1416 equals $7.854 \times$

(*Continued on page* 64)

The Minneapolis Heating, Ventilating and Air Conditioning Ordinance [Part 3]

FURNACES, CONSTRUCTION AND INSTALLATION OF

Section 1105. The construction and installation of all warm air furnaces hereafter installed in connection with gravity warm air heating plants in the City of Minneapolis shall, except as elsewhere in this ordinance otherwise provided, comply with the following requirements:

1105.1 Location of: The location of the furnace shall be such as to equalize the length of warm air pipes as far as possible, yet give necessary preference to pipes supplying rooms having unusual requirements.

1105.2 Foundations or Other Supports for: Furnace foundation of brick, cement, or other like incombustible material shall be provided. Said foundation shall extend at least fifteen (15) inches at rear and sides of furnace casing and at least thirty-six (36) inches in front of furnace casing. Foundation shall be level.

Where it is necessary to place a furnace on a combustible floor, not less than four (4) inches of hollow tile shall be used in every instance, having joints matched in such a way that air passage will be free from side to side so that at no time will the removal of ashes or the handling of coal close up these openings. Such foundation shall be constructed upon and covered with continuous sheet metal plates of weight not less than No. 24 U. S. Standard gauge metal, having all joints substantially riveted or double seamed and the bottom sheet to have the edges turned up at least one inch. This floor covering shall extend under the whole of the fire box and ash pit of the furnace and outwardly not less than twelve (12) inches on all sides and rear of casing or base ring, and thirty-six (36) inches in front.

1105.3 Setting or Assembling of: The base ring of any portable warm air furnace shall be cemented to the foundation, and cement flushed in around the back of the base ring, making an air-tight joint. The furnace parts shall be assembled plumb and level and in a workmanlike manner.

All sections and joints shall be properly fitted. Joints requiring cement shall be well filled and all bolts shall be drawn up tightly.

1105.4 Casings: Warm air furnaces shall be enclosed in metal casings or walls of brick, tile or concrete.

Portable sheet metal casings including tops or bonnets shall be made of galvanized sheets, not lighter than No. 26 U. S. Standard gauge. They shall fit the castings and casing rings closely, so as to be dust-tight, and shall be securely fastened to the front. The casing shall be lined from the upper casing ring down to the line on a level with the grate.

When side collars are used, the casing top or bonnet shall be of sufficient height so that the largest warm air pipe can be taken from the side without ovaling. In no case shall a distance less than eight (8) inches be maintained between the top of any furnace and the bonnet.

The first Minneapolis code was formulated in 1926. This revised code, made effective this spring, was written chiefly by the Building Inspection Department from its experience. Until this year the Minneapolis code has been eminently satisfactory—as proof—heating firms decreased from 133 to 40 between 1926 and 1935. This year lack of funds has necessitated economies admitting some violations but more building is raising revenue. More of the code will be published next month. We will gladly answer questions.

◆

Any furnace, the casing top of which shall come within twelve (12) inches of a combustible floor, ceiling or joist, shall be protected by a metal shield, extending not less than eighteen (18) inches beyond the casing of said furnace. This shield shall be suspended at least two (2) inches below woodwork, allowing free air space between shield and woodwork. No furnace casing or top, coming within less than six (6) inches of ceiling or joists shall be allowed in any case. All metal casing tops shall be insulated with an air space or covered with magnesia, asbestos boiler covering or sand.

Openings for side casing collars shall be cut into the casing top or bonnet, so that the tops of all openings are on a level. Casing collars shall be fitted into place with a proper flange, or bead on the outside and drawn up on the inside, making a dust-tight joint. All collars should be of the same size as the warm air pipes to which they are to be connected.

1105.5 Warm Air Pipes in Basement: All warm air pipes shall be made of bright tin not lighter than IC, or of galvanized iron. Side seams shall be locked seams. All joints shall be either double seamed or lapped not less than one and one-quarter (1¼) inches. Such joints shall be match-beaded, or beaded and soldered, or riveted. All pipes and fittings shall be properly secured to ceiling or joists. No soldered or riveted joint is required where round pipe slips over the casing collar or enters boot or box. Any pipe fourteen (14) inches or greater in diameter shall be made of material not lighter than IX tin or No. 26 U. S. Standard gauge galvanized iron.

All warm air pipes in the basement shall have an upward pitch of not less than one (1) inch per running foot.

No warm air pipe shall run within one (1) inch of any woodwork unless such woodwork or the pipe is covered with asbestos paper weighing not less than twelve (12) pounds per one hundred (100) square feet.

All warm air pipes in the basement shall be provided with dampers supported on both sides not more than two (2) feet from the casing, except as provided in Sub-Section 1105.7. Where warm air pipes pass thru a masonry wall, a metal thimble shall be provided having a diameter at least one (1) inch greater than the pipe, and the pipe supported in such a manner that the air space is uniform on all sides.

Where warm air pipes pass thru or into unheated spaces separated from the furnace room, they shall be insulated with not less than three (3) layers of air cell asbestos paper or the equivalent.

1105.6 Wall Stacks: All single wall stacks or wall pipes, heads, boots, ells, tees, angles and other connections shall be made of bright tin not lighter than IC, or of galvanized iron and shall be covered with not less than one thickness of asbestos paper weighing not less than twelve (12) pounds per one hundred (100) square feet. All such stacks shall be braced in a proper manner, so as not to obstruct the flow of air but to retain the full capacity throughout. All joints shall be locked and held in place by means of lugs or straps. No joint, either horizontal or vertical, shall depend wholly upon solder to make it tight. An air space of not less than five-sixteenths (5/16) of an inch shall be allowed on the two sides nearest the vertical studs.

All double wall stacks or wall pipes, heads, boots, ells, tees, angles and other connections shall be made of tin not lighter than IC, or of galvanized iron, and shall be made double, from and including the boot or foot piece in basement to the top of each and every stack and register head on all floors. There shall be a uniform air space of not less than five-sixteenths (5/16) of an inch which must be maintained between the outer and inner walls of all such pipes and fittings of all kinds, styles and descriptions; such pipes, heads, boots and other fittings to be subject to the approval of the Department of Buildings.

All stacks and fittings, either single or double, must be secured firmly in place by lugs or straps attached to the outer walls of stacks and fittings, and no nails shall be driven through these stacks or fittings at any point. No lugs or straps shall be formed by cut-

tings holes in outer walls of stacks or fittings. No wall pipes or fittings shall be used which depend wholly on soldered joints. The various members shall be so made that all joints are locked or soldered and the several members shall be attached to each other with slip joints, which are, for the purpose intended, air tight.

Where stacks, heads, boots or other fittings, whether double or single, go through the first floor, all openings around such heads, boots, stacks or fittings must be filled with asbestos cement or other incombustible insulating material to make the openings gas and dust tight. In no case shall any metal surface of stacks, heads, boots or other fittings conveying heated air come in contact with any wood girder, joists or flooring of the first floor.

1105.7 Registers: When baseboard or wall registers are used, they shall be properly sealed to the stack head in such a manner as to prevent any leakage of air between the head and the register.

Floor registers shall be provided with double register boxes of tin or galvanized iron, with an air space of not less than five-sixteenths (5/16) of an inch between inner and outer boxes; or, where single boxes are used, they shall be insulated from the wood or other combustible material by asbestos paper covered with sheet metal, or by the use of register borders.

Registers for warm air, and warm air pipes, stacks and fittings, shall not be located in outside walls, unless properly insulated with one (1) inch air-cell covering or its equivalent.

In any furnace system having not more than two (2) warm air openings, at least one (1) of these openings shall be without valve on louvers, and the pipe thereto shall be without damper.

1105.8 Air Supply to Furnace: (a) The air supply to the furnace may be taken from outside or from within the building, or may be taken partially from outside and partially from within. In no case, however, shall air be supplied to any furnace from any basement or furnace room not occupied in part as living quarters.

(b) The cold air intake or return, where air is taken from within the building, shall have a net area throughout its entire length of not less than the combined net area of all warm air pipes leading from the furnace. This may be maintained in one or more ducts. No reverse incline or air trap will be allowed in any section thereof.

(c) When the cold air supply is taken wholly from the outside of the building, the supply duct at its most contracted area must equal or exceed eighty (80) per cent of the combined area of all warm air pipes leading from the furnace.

(d) Cold air ducts, except as provided in Sub-Section 1105.8 (f) shall be constructed of metal, tile or other non-combustible material having a smooth inner surface and shall maintain a constant net area throughout their entire length. All joints shall be made dust tight. Horizontal, rectangular return ducts shall have at least ten (10) per cent greater area than vertical connecting pipes.

(e) Where a boot or shoe is connected to the casing at the base the opening shall not extend higher than a line on the level of the top of the grate of the furnace. The width of the shoe shall be of proper measurement to make the area at all points at least equal to that of the round or square pipe to which it is connected. The boot or shoe shall be of streamline transition construction.

(f) Wherever the space between joists is used to convey cold air overhead, all bridging and bracing shall be removed and the bottom covered with sheet metal so constructed as to extend far enough below bottom of joists to provide the required free area through the duct so formed. The connection from this pan to the boot or shoe shall be made of galvanized iron not lighter than No. 26 U. S. Standard gauge, and shall have a transition fitting, the top area of which shall be at least ten (10) per cent greater than the area of the connecting pipe.

Note: To reduce friction, and for the sake of cleanliness, it is recommended that the joists, and all wooden surfaces between such joists, be lined with metal.

(g) When it is necessary to set the furnace over a pit and connect up cold air under the basement floor, such pit or cold air trench shall not exceed 18 (18) inches in depth below the casing base ring and the width of the trench or trenches shall be of proper measurement to make the area at least ten (10) per cent greater than the pipe to which it is connected. The connection between the cold air pipe or duct and the underground pit shall be made with a transition fitting as described in Sub-Section 1105.8 (f).

(h) The cold air face or faces shall be made of wood or metal. When set in floor the top of same shall be flush with floor. Where cold air face is placed in a seat or side wall (whether furnished by owner, general contractor or furnace contractor), the open work of face shall extend to within at least one (1) inch of the floor line.

The free area of cold air faces shall be at least equal to the free area of the duct or ducts to which they are connected.

(i) When a fan is installed in the air supply duct or bonnet of a gravity system the same net area of all ducts shall be maintained as provided in Section 1102 of this ordinance.

1105.9 Pipeless or One Pipe Furnaces: When but one duplex grating is used for both warm air and cold air in a so-called pipeless furnace, the area of the cold air intake shall be at least equal to the area of the warm air outlet of the grating. Sub-Section 1105.4 relative to casings shall not govern when this type of furnace is installed, but the following specification shall be followed: The inner and outer casings of this type of furnace may be made of either black or galvanized iron not lighter than No. 26 U. S. Standard gauge. Where the outer casing is made of black iron, it shall be painted with a mineral paint. A uniform air space shall be maintained at all points between the inner and outer casing. In no case shall the top of the heater be allowed closer than twelve (12) inches to any ceiling or joists above the furnace.

Where joists are cut to accommodate such a furnace, headers shall be put in and braced.

Section 1102 for determining area of warm air pipe shall not govern in figuring a pipeless furnace.

Where one warm air register face is used and separate face or faces for cold air supply are used, then Sub-Sections 1105.5, 1105.7 and 1105.8 shall apply.

In figuring the heating capacity of a pipeless furnace, the same method of computation shall be employed as for pipe furnaces, as set forth in Section 1104 of this ordinance, and to the heating capacity so found shall be added twenty-five (25) per cent. In no case shall any such pipeless furnace be installed in any building whose heating capacity after the above 25 per cent is added, is less than the total combined warm air leader pipe capacity which would be required by Sub-Section 1102.1 of this ordinance were a pipe furnace to be installed to heat said building.

Section 1106. Headers When: Spacing of Studdings and Joists:

Whenever it is necessary, in installing or altering any warm air heating plant, to cut joists or supporting members, proper headers shall be put in, and additional supports shall be provided when necessary to prevent weakening of the structure, in a manner subject to the approval of the Inspector of Buildings.

1106.1. Where warm air stacks or risers enter the wall, in any building under construction, the studdings shall be set directly over and under the adjacent joists, leaving a net space of not less than fourteen (14) inches between studs and between joists.

(To be continued)

This very complete Minneapolis Code will require two or three more issues to publish. Meanwhile if any readers or associations wish information write us or write directly to Minneapolis.

In the first article (October) the code covered approved method for securing any contract. The second article (November) covered the selection of smoke pipe size and weight and the design for gravity warm air installations.

This issue presents such important recommendations as setting the furnace, weight of leader pipe, approved wall stacks, register placing, return air supply construction, and design for pipeless furnace installations.

Future excerpts will cover mechanical warm air heating, sheet metal construction, automatic heat and penalties.

Air Conditioning Section

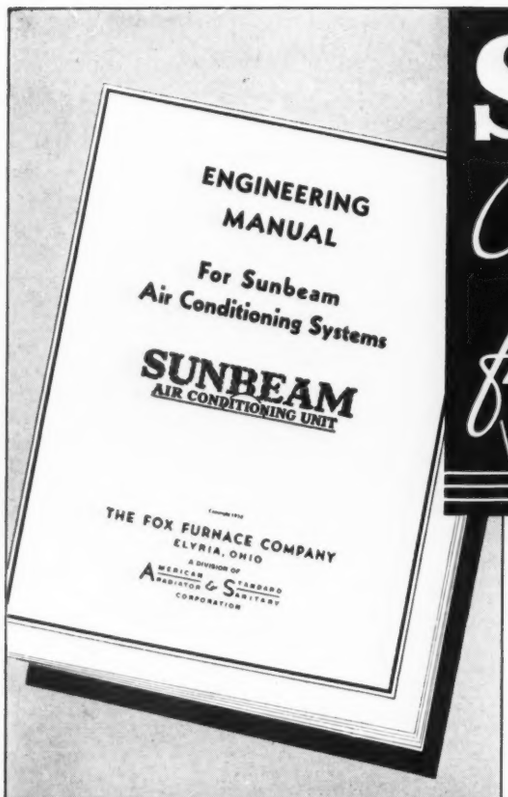
Devoted to the technical and merchandising problems of air conditioning in homes and small buildings

THE industry has had sufficient experience with winter air conditioning, we think, to consider, now, some of the important problems of air humidification, cleaning, purification.

- - - Only scattered efforts have been made to establish exactly what we can offer with the knowledge and apparatus now on the market. Research is needed—the kind of research we gave to forced air circulation, duct design, heat loss, etc.

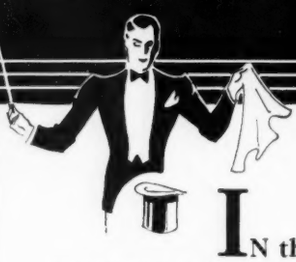
- - - If we can establish the limitations of practical humidification; the efficiency of cleaning as actually delivered in a home; the practicability of purification, we will arm ourselves with weapons no other industry can use.

- - - Associations, research programs, even the individual contractor can contribute needed information — if they will.



More Furnace Dealers sell Sunbeam Furnaces and Air Conditioning Units than any other Kind

SUNBEAM *Removes the mystery from* AIR CONDITIONING



IN the new 16-page Engineering Manual illustrated above, Sunbeam has removed the mystery from the calculating and laying out of residential air conditioning systems. Any intelligent heating contractor can learn how to design systems from this book in approximately one-half an hour.

The factors which are used are based on the recommendations of the Guide of the Society of Heating and Ventilating Engineers. So this manual is exact! And absolutely accurate! It is not satisfied with *approximate* results. Sunbeam engineers, who have designed thousands of heating and air conditioning systems, have developed this Manual so that a single multiplication of the amount of exposed surface is all that is needed. This simplification saves time! Reduces the chances for errors in your calculations!

A copy of this manual—a complimentary contribution by the world's largest makers of heating equipment to the advancement and education of the heating trade—will be furnished free of charge to any furnace dealer who requests it on his business letterhead. Unfortunately it cannot be distributed indiscriminately and free of charge to the thousands of individuals who will rush to obtain a copy. If you are entitled to a copy of this modern Engineering Manual, you can conveniently request it by attaching the coupon below to your business letterhead.

Information Contained In This Manual

- How to Estimate Heating Requirements
- Requirements When Heating Garage—Outside Air
- Tables for Converting C. F. M. Into Required Duct, Riser and Register Sizes
- Factors for 32 Different Types of Constructions
- Six Different Factors for Temperature Differences Ranging from 20° above to 30° below Zero.
- Trunk Line Design
- Individual Pipe Systems
- Bathroom Vents
- Dampers in Pipes and Ducts
- How to Avoid High Resistance in Ducts
- A Sample Air Conditioning Layout
- Data Sheet for Sample Layout
- When and How to Insulate Ducts

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A Division of AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

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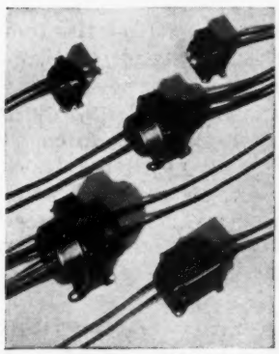

Choose G-E control transformers for safety, convenience, and simplicity of wiring wherever small solenoids, relays, motors, lamps, and similar accessories needed for an air-conditioning installation must be operated at various voltages—stepped down from the lighting circuit.

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Housed in a strong, steel case with an attractive aluminum face plate, it is easily installed—convenient conduit knock-outs are located in both top and bottom. It is equipped with unusually large, pure-silver contacts—an assurance of long life and trouble-free service. It has snap action, which prevents slow opening or closing, and also prevents burning of contacts.

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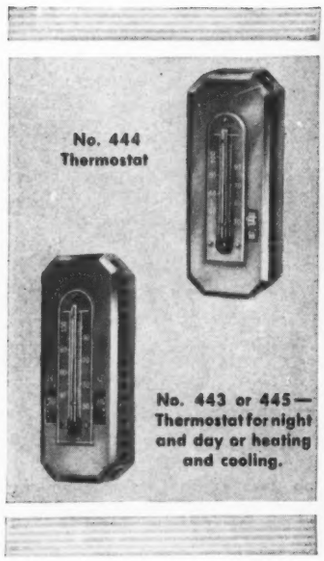

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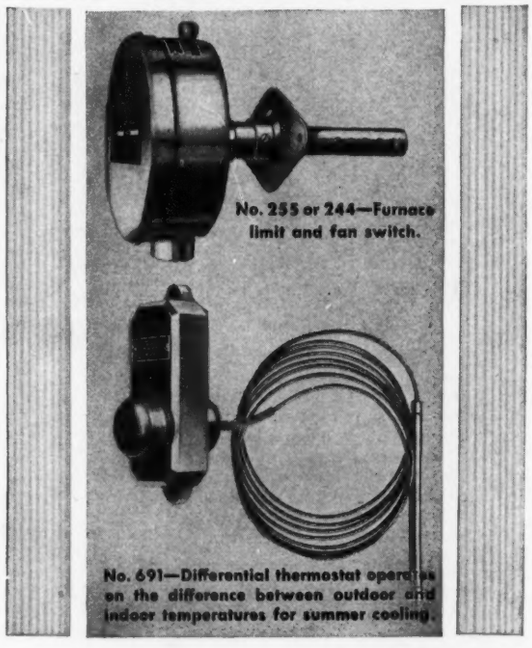
The new mounting bracket materially simplifies installation. The shaft hole is accurately located. No measurements on the job are required


No. 255 or 244—Furnace
limit and fan switch.
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Condensation—

An Important Consideration In Gas-Fired Air Conditioning Plants——

By William R. Morgan*

The first article on this subject (December, 1934) explained how tests determined the amount of condensation with some 23 different fuels. This article shows how firing rate, indoor-outdoor temperature difference and flue gas temperature determine the amount of condensation.

Relation Between Firing Rate and Flue-Gas Temperature

IN order to determine actual condensation it is necessary to know the relation between firing rates and resulting flue-gas temperatures. Through the courtesy of the Department of Mechanical Engineering, in cooperation with the National Warm-Air Heating Association, it has been possible to obtain such data for anthracite and bituminous coal and for manufactured gas under actual operating conditions.

The residence used for the tests was of standard three-story frame dwelling construction, heat being supplied to all three floors.

A gravity circulating warm-air heating plant of the common cast-iron type was used for all tests. The grate area for coal tests was 2.88 square feet. For gas tests, the furnace was equipped with a surface combustion burner.

The smoke pipe, which was 10 inches in diameter, and 10 feet long, was connected to a 12-inch by 12-inch fire-clay-lined flue 35 feet high. All flue-gas temperatures used in the calculations were measured at the roof line, 3 feet below the top of the chimney.

In Fig. 4 are shown the relations between firing rate and indoor-outdoor temperature difference (assuming indoor temperature of 70 deg. F.) for soft or bituminous coal, anthracite, and manufactured gas. It is readily seen that fuels cannot be compared on equal firing rates; that is, in zero weather the firing rates for soft coal, anthracite, and manufactured gas are 164,000, 124,000, and 112,000 B.t.u. per hour, respectively. In general, for equivalent indoor-outdoor temperature differences, and equal

(*Continued on page* 44)

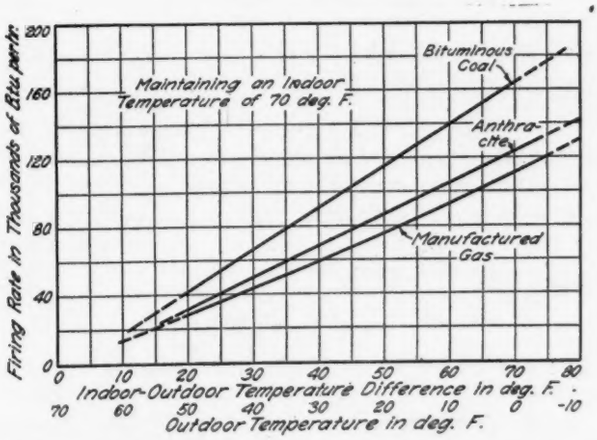

Firing Rate in Thousands of Btu per hr.
Maintaining an Indoor Temperature of 70 deg. F.
Bituminous Coal
Anthracite
Manufactured Gas
Indoor-Outdoor Temperature Difference in deg. F.
Outdoor Temperature in deg. F.

Fig. 4—Relation between indoor-outdoor temperature difference and firing rate.

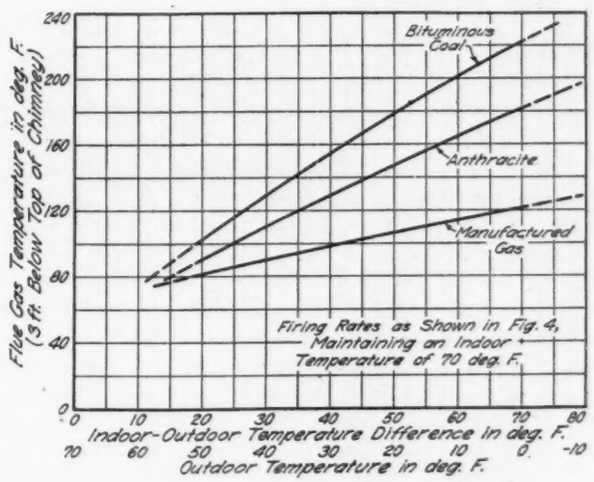

Flue Gas Temperature in deg. F. (3 Ft. Below Top of Chimney)
Bituminous Coal
Anthracite
Manufactured Gas
Firing Rates as Shown in Fig. 4, Maintaining an Indoor Temperature of 70 deg. F.
Indoor-Outdoor Temperature Difference in deg. F.
Outdoor Temperature in deg. F.

Fig. 5—Relation between indoor-outdoor temperature difference and flue gas temperature.

Special Research Assistant in Ceramic Engineering, University of Illinois, Urbana, Ill. This article is taken from a report of an investigation conducted by the Engineering Experiment Station of the University of Illinois in conjunction with the Clay Products Association. Report issued as Circular 22.

Forced Air Heating Facts From the Research Residence

[Pressure Losses]

By S. Konzo
Special Research Associate,
University of Illinois

This article discusses where losses occur and how great the losses are. Part of the discussion is based on data published in Bulletin 266 of the Engineering Experiment Station of the University of Illinois.

IN the November article the discussion was centered on the topic of fan ratings. The main points of that discussion can be briefly summarized in the following sentences:

1. In selecting a fan for a given installation, not only must the volume of air be specified, but also the resistance against which the fan is to deliver the air should be considered. In other words, the fan should be capable of delivering the air against some stated pressure.

2. Fan ratings can be established by actual tests made in accordance with the "Standard Code for Testing of Centrifugal and Disk Fans."

3. The conditions in an actual duct installation are not precisely the same as those existing in the test installation when the fans are rated. In the latter case the resistance imposed on the fan is entirely on the outlet side of the fan; in addition the average velocity of the air in the outlet duct is the same as that at the fan outlet. On the other hand, in the case of the actual duct installation, the resistance is imposed on the inlet side as well as on the outlet side of the fan, and the air velocity in the outlet duct is usually not the same as that at the outlet of the fan.

4. Strictly speaking, the fan for a forced-air heating system should be selected on a basis of total pressures only. That is, the total pressure in the duct installation should be equal to the total pressure as stated in the fan rating.

5. For most ordinary domestic heating installations, the approximate method of selecting the fan gives results that are in fair agreement with the more precise method. In the approximate method the "pressure loss in the duct system" is set equal to the "static pressure" against which the fan must deliver its air.

6. If the installer of the fan can specify the volume delivery required and the static pressure (or losses) which the fan must overcome, the fan manufacturer will be able to supply the following information,—(a) the type of fan, (b) fan speed required, (c) brake horsepower consumption, and (d) size of motor required.

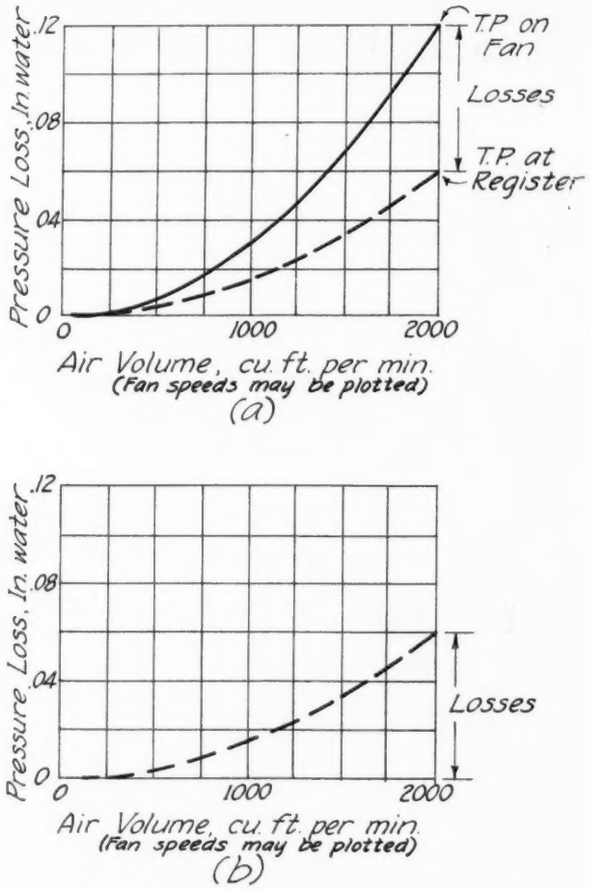


Fig. 1—"A"—Total pressure at two points in a duct system, showing losses between the two points. "B"—Pressure loss obtained from "A" plotted separately. Note manner in which losses increase. See also Fig. 5 in which the same method of presentation is used for Research Residence data on pressure losses.

7. The "brake horse-power" is equivalent to the net power required to turn the fan. The "power input" to the electric motor is equivalent to the gross power required to turn the fan and overcome the losses in the motor. The "air horse-power" is a measure of the rate of energy transmission to the air.

General Considerations

From this brief discussion it is apparent that the selection of a fan is dependent to a very great extent on the proper determination of the pressure against which the fan must deliver a given volume of air. The factors affecting the determination of the air volume for any given installation will be considered in a subsequent article; whereas, in this issue the pressures existing in various parts of the duct system will be considered in detail.

Before considering specific cases of pressure losses it is convenient at this point to enumerate a few general items concerning pressure losses, as follows:

1. As stated before, the pressure loss between any two points in the duct system is equal to the difference in total pressures at the two points. (See top part of Fig. 1). The pressure loss is equal to the static pressure between the two points only when

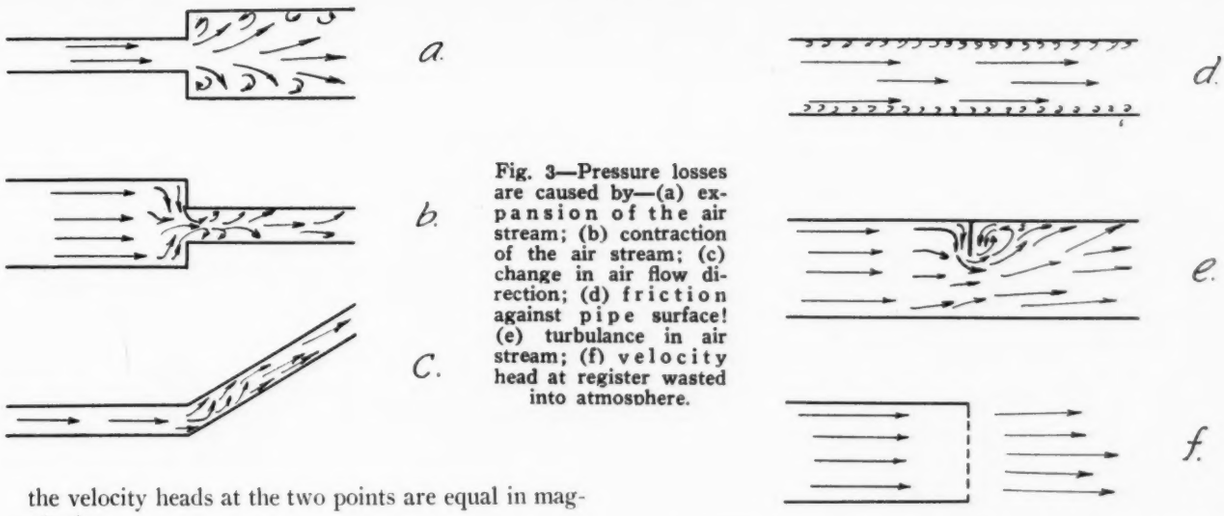


Fig. 3—Pressure losses are caused by—(a) expansion of the air stream; (b) contraction of the air stream; (c) change in air flow direction; (d) friction against pipe surface! (e) turbulance in air stream; (f) velocity head at register wasted into atmosphere.

the velocity heads at the two points are equal in magnitude.

2. Pressure losses between any two points in a duct system increase as the square of the velocity. (See lower part of Fig. 1.) That is, by doubling the air velocity in the duct system, the pressure losses between the two points will be increased four-fold.

3. When moving air is expanded into a chamber so that the air velocity is decreased, the existing velocity head is partially converted into static pressure. Such an action takes place in the bonnet of the usual furnace installation. For instance in Fig. 2 the greatest static pressure in the system will usually exist in plane 1-1′ at the top of the bonnet. Every duct taken off from the bonnet, therefore, has an equal initial static pressure existing in the bonnet. With reference to the ducts shown in Fig. 2 this means that the static pressure available at the inlet of duct A is equal to that available at the inlet to duct B.

4. In the case of multiple take-offs from the same bonnet, as shown by ducts A and B in Fig. 2, the pressure change in each duct from bonnet to register will be exactly equal in magnitude. In other words, the static pressure head available at the bonnet will be entirely dissipated whether the duct is long, as shown by duct A, or whether it is short as shown by duct B.

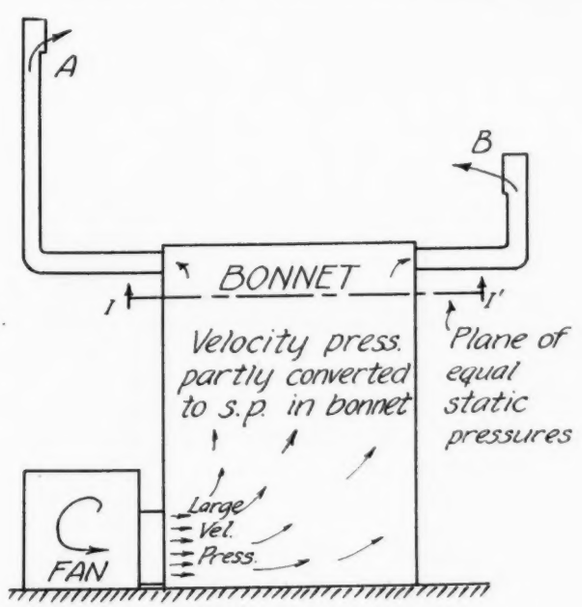


Fig. 2—The largest static pressure usually occurs at plane 1—1′ shown in the diagram of the bonnet. Both ducts A and B have equal pressure existing at the take-off from the bonnet.

5. Pressure losses of a moving air stream are composed of one or any combination of the following factors. (See Fig. 3.)

(a) Losses due to expansion of the air stream.
(b) Losses due to contraction of the air stream.
(c) Losses due to change in direction of the air flow.
(d) Losses due to friction of air stream on the sides of the containing duct section.
(e) Losses due to turbulence of the air stream.
(f) Losses due to discarding the velocity head at the end of the duct.

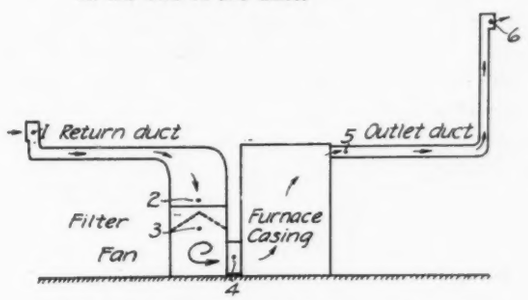


Fig. 4—Line diagram of actual duct installation showing various parts of the system which impose pressure resistance to air flow.

6. The pressure losses through a forced-air heating system may be subdivided into the following arbitrary divisions. (See Fig. 4.)

Suction side of system—
(a) Loss through return grille.
(b) Loss through return duct.
(c) Loss through air filters, air washers, cooling coils, etc.

Pressure side of system—
(d) Loss through casing.
1. Entrance loss into casing.
2. Frictional loss through casing.
3. Entrance loss into warm-air ducts.

(*Continued on page 37*)

Air Conditioning For A Surgery

The drawing on the facing page shows details of the system "before" and "after." The ultimate result is a room with adequate humidity and air surgically clean. The text describes the problems and means of obtaining the desired results. The author suggests that these methods may be applied to other special problems.

By W. E. Ottinger

THE heating and ventilating system serving the surgical department at Mount Sinai Hospital, Cleveland, was designed in accordance with the prevailing good practice of twenty years ago.

As shown in Fig. 1, outside air, tempered by two cast iron heating units, was drawn into a motor driven, belted blower. There was a bank of four heating coils just beyond the blower, then the damper regulators, then an elbow, a horizontal run for a short distance along the ceiling, then the duct turned down and ran vertically to the floor below.

Ducts under the third floor surgery group formed a plenum chamber, from which the warmed air passed upward through square mesh brass grilles about 8 inches wide, on sills 3 ft. above the floor, into the rooms. In the main operating rooms there are inside windows or glass partitions, extending to within 1 ft. of the ceiling. In the anesthesia and recovery room, minor operating room, delivery room and labor room, the warmed air is discharged directly out through the grilles on the window sills. The arrangements are shown in Figs. 2 and 3.

The soot and grime from neighboring buildings, most of which burn soft coal, had been bringing so much dirt into the surgery rooms as to make conditions almost intolerable. Cloth screens placed over the grilles stopped some of the dirt, at the same time stopping much of the necessary air flow. Needless to say, the dirty cloth screens were both unsightly and unsanitary.

In addition to the dirt, it will be obvious that the surgery department at Mount Sinai Hospital suffered from deficient humidity, a condition detrimental to health under any conditions, but in an operating room positively harmful to the point of physical danger. Besides, lack of sufficient moisture might easily lead to a dangerous condition whereby static electricity would be supported, rendering the use of ethylene anesthetics positively hazardous.

The hospital's available funds being none too ample, it was out of the question to install elaborate equipment to filter and humidify the air. Furthermore, whatever equipment was installed had to fit into a section of duct only 30 inches wide by 42 inches deep and less than 3 feet long, between the tempering coils and the blower inlet.

Fig. 4 shows in section what was done. A special combination air filter and water eliminator, 24 inches wide by 30 inches deep, was made in the form of a vertical slide, with handles in the top sheet, and fitted into a rectangular slot cut in the top of the duct.

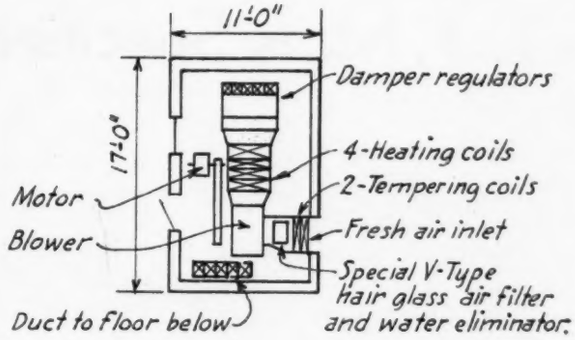
Inasmuch as the air handling system was designed without allowance for resistances introduced by future filters, it was necessary to increase the surface as much as possible, thereby holding the resistance to air flow at an absolute minimum.

The increase of surface was accomplished by crimping the material (long fibre spun glass held between galvanized steel screens) to such an extent as to provide 5 times the apparent head-on surface, making a total active filtering surface of 25 square feet.

To prevent the accumulation of dirt from increasing the filter resistance, the surface is continually flushed by a fine spray of water, a special wide-angle centrifugal nozzle being placed about 18 inches in front of the filter-eliminator. Practically none of the amount of water sprayed, about 15 gallons per hour, gets past the filter-eliminator in the form of raw water, and enough of the spray water is evaporated to produce much more desirable humidity conditions in the surgery rooms.

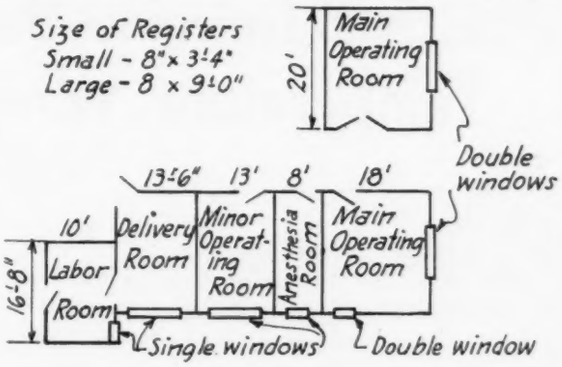
The duct area around the filter-eliminator was, of course, blocked off, to force all the tempered air through the cleaning equipment. To guard against any possibility of stoppage of the drain system causing the penthouse to become flooded, the ingenious protective device shown in Fig. 5 was designed and installed by S. Wonnacott, Chief Engineer.

Due to the hearty co-operation of Dr. H. L. Rockwood, Director of Mount Sinai Hospital, as well as Mr. Wonnacott, the installation has been a decided success and a source of great satisfaction and comfort to the surgical staff of the institution and to the patients served.



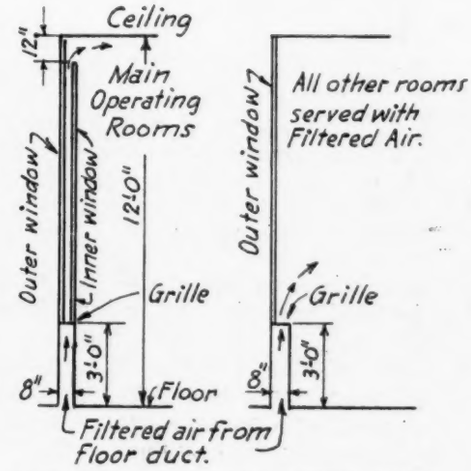
PLAN OF PENT HOUSE ON ROOF ABOVE THIRD FLOOR

Fig. 1



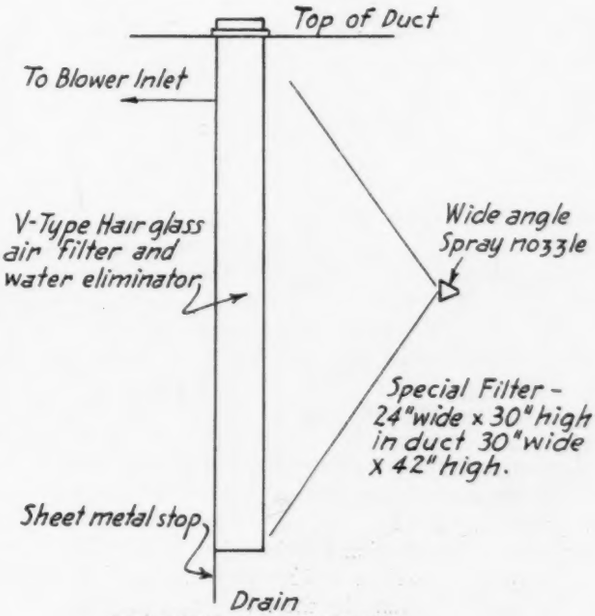
PLAN OF THIRD FLOOR ROOMS

Fig. 2



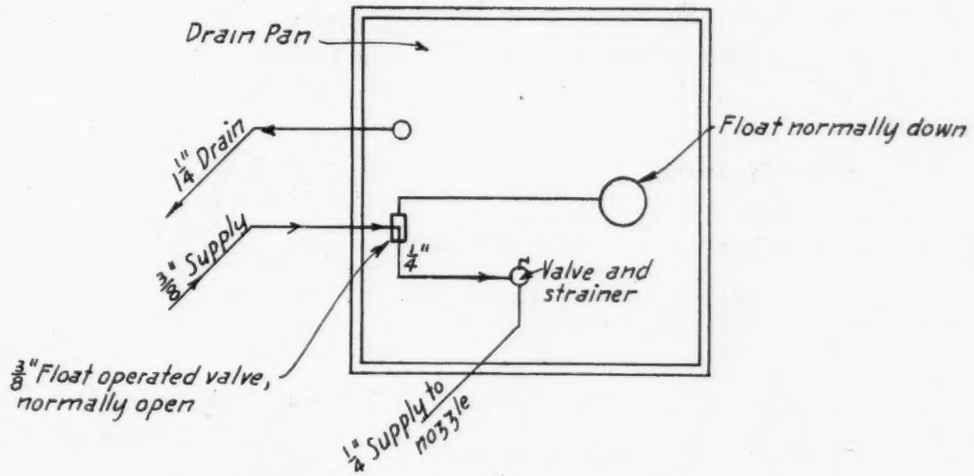
ELEVATION OF THIRD FLOOR ROOMS WHERE FILTERED AIR ENTERS

Fig. 3


Top of Duct
To Blower Inlet
V-Type Hair glass air filter and water eliminator
Wide angle Spray nozzle
Special Filter - 24" wide x 30" high in duct 30" wide x 42" high.
Sheet metal stop
Drain

SECTION AT FILTER

Fig. 4



WATER SUPPLY AND DRAIN SERVING FILTER

Fig. 5

Rules to Determine the Register Temperature When C. F. M. Is Specified

By William Scott

IN forced air heating, either the c.f.m. or the register temperature may be selected at will; but when either has been fixed by law or otherwise, the other must be calculated.

Ordinarily, in residence work, it is required to find the c.f.m. after the register temperature has been selected, and for this, ample rules are available; but a different problem is presented in the heating of public buildings, such as schools and churches, when the specifications call for a definite number of "cubic feet per minute per person," using outside air wholly or partly. It is the purpose of this article to discuss such cases.

At the outset, there are some ambiguities in heating nomenclature that lead to confusion. Herein a cubic

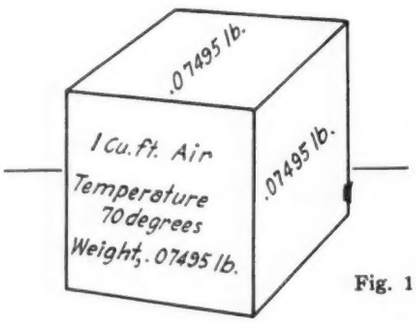


Fig. 1

foot of air, unless otherwise indicated, will mean a cubic foot at 70 degrees temperature, weighing .07495 lb., as shown graphically in Fig. 1.

Whatever the specification may be, whether for c.f.m. at zero, at —10, at —20 or at 120, the c.f.m. at 70 degrees may easily be found by the following equations:

(a) c.f.m. at zero $\times$ 1.152 = c.f.m at 70 degrees.

(b) c.f.m. at —10 degrees $\times$ 1.177 = c.f.m. at 70 degrees.

(c) c.f.m. at —20 degrees $\times$ 1.191 = c.f.m. at 70 degrees.

(d) $\dfrac{\text{c.f.m. at 120 degrees}}{1.0945}$ = c.f.m. at 70 degrees.

Register Temperature

Whether all or part of the air is taken from outside, the temperature at the register, can be found by equation (1).

(1) $\dfrac{H}{1.08 \times \text{c.f.m}} + R = Rt.$

Wherein:

H = heat losses as ordinarily calculated and expressed in B.t.u.

C.f.m. = number of cubic feet per minute at 70 degrees temperature.

R = room temperature.

Rt = temperature of air at register.

Rule 1. To find register temperature, divide heat losses by 1.08 times the cubic feet per minute, and add the room temperature.

The register temperature thus found is the highest that can be used; but if for any reason, it is deemed too high, a lower temperature may be selected, but this will increase the specified c.f.m.

Cubic Feet Per Minute

To find the required cubic feet per minute, transpose R to the second member of equation (1), thus:

(2) $\dfrac{H}{1.08 \times \text{c.f.m.}} = Rt - R$

From which:

(3) $\dfrac{H}{1.08 \times (Rt - R)} = \text{c.f.m.}$

Rule 2. To find number of cubic feet per minute, subtract room temperature from register temperature, multiply by 1.08, and divide the heat losses by this product.

Outside Air

If all the air is taken from outside, the total B.t.u. for both heat and ventilation may be found from equation (4).

(4) 75.6 $\times$ c.f.m. + H = total B.t.u. required.

Rule 3. If all air is from outside, at zero temperature, multiply the c.f.m. by 75.6, add the calculated heat losses, and the result is the total B.t.u.

Part Outside Air

If part of the air is from outside, apply equation (5).

(5) 75.6 $\times$ c.f.m. from outside + 5.4 $\times$ c.f.m. from inside + H = total B.t.u. required.

Rule 4. Multiply the c.f.m. from outside by 75.6; multiply the c.f.m. from inside by 5.4; add the sum of these products to the heat losses, and the result is the total B.t.u. required.

All Inside Air

If all the air is from inside, equation (5) becomes:

(6) 5.4 $\times$ c.f.m. + H = total B.t.u. required.

Rule 5. If all air is from inside, add to the heat losses 5.4 $\times$ the c.f.m. to find the total B.t.u. required

Rule 6. If an outside temperature lower than zero is to be considered, first find the B.t.u. required by the foregoing rules; then add to this number one-seventh of itself for each ten degrees below zero. Also, c.f.m. will increase in the same ratio as B.t.u.

Problems

Now, let us examine some problems. On page 515 of his book, Daniels submits the problem of a room with

(*Continued on page* 43)

Characteristics of Registers and Grilles*

By J. H. Van Alsburg
Member A. S. H. V. E.†

DURING the last few years when rapid progress has been made in the air conditioning industry, emphasis has been placed upon those phases of the installation which seemed to be most important with the result that little attention was paid to the effect which the registers or grilles have on the performance of the system. Now it is apparent that registers and grilles directly affect the system in the following respects: 1. Noise, 2. Resistance, 3. Volume, 4. Flow, 5. Appearance.

An attempt will be made in this paper to outline the latest information available regarding the effect of registers and grilles on these five characteristics. This information is based on the results of many tests carried on since 1922. Several types of grilles are discussed, but no attempt to favor any particular manufacturer's design is intended, nor is any pretense made that the information given is final and complete. Much remains to be done on this subject and it is hoped that this paper will serve to stimulate further research and investigation.

At this point it is desirable to define the terms used in this paper. A grille is primarily a grating, used to conceal or decorate an opening through which air passes. A grille has no provision for controlling air volume. A register is the combination of a grille and some means for regulating air flow. A supply grille is one which admits air *into* a room or other enclosed space. A recirculating grille is one through which air is withdrawn from the room. Unless otherwise stated, the information given in this paper applies to supply grilles.

Test Apparatus

A room approximately 40x20x12 feet was used as a test laboratory. The testing apparatus, as shown in Fig. 1 consists of a standard blower, discharging a volume of air into a horizontal plenum chamber. From this chamber the air passes into a vertical duct, which makes a right angle expanding approach to the grille to be tested.

These tests were made with typical grilles of standard manufacture, all size 12x6, as shown in Fig. 2.

Smoke bombs were used to determine the path of the air stream and a standard 4 inch K. & E. anemometer, which was recently calibrated, was used for all velocity readings. In making the velocity readings at the register to determine the average velocity, the grille was blocked off in squares with chalk and one minute readings were taken of each block to determine an average for the total area.

In checking the velocity of the air away from the grille to determine the path of the air stream, the anemometer was used as described under Methods of Testing. A pitot tube was used with a Hays manometer for making all pressure readings, which were taken in the vertical riser above the plenum chamber, midway between the plenum chamber and the approach. These readings were taken by making a traverse to establish an average for the pressure at this point.

No suitable test apparatus was available for determining the noise level, and the blower, being in the test room near the grille, made it difficult to determine the cause of the noise. Therefore in the absence of suitable noise measuring devices, noise was determined by the hearing of several individuals assisting in this test.

Method of Testing

Lines were drawn on the test room floor as shown by Fig. 3, to serve as guides in taking velocity readings. Readings were taken at all intersections of these lines at 4 inch intervals above and below the center line of the grille at as high or as low a level as required to record

*Paper presented at meeting of A. S. H. V. E., Toronto, Can., June, 1935.
†Engineer, Hart and Cooley Co., Holland, Michigan.

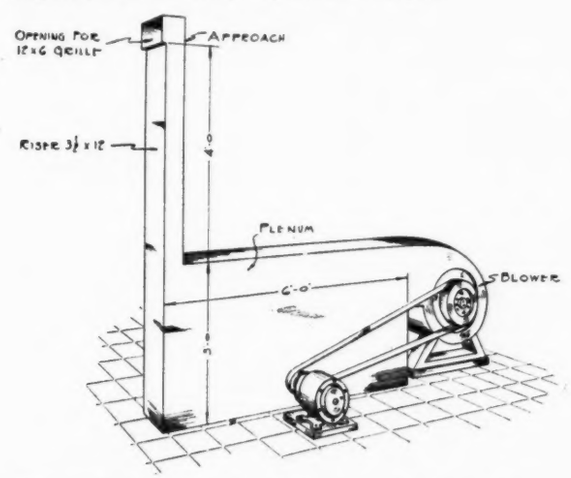


Fig. 1—Drawing showing arrangement of testing apparatus used in tests described in this paper.

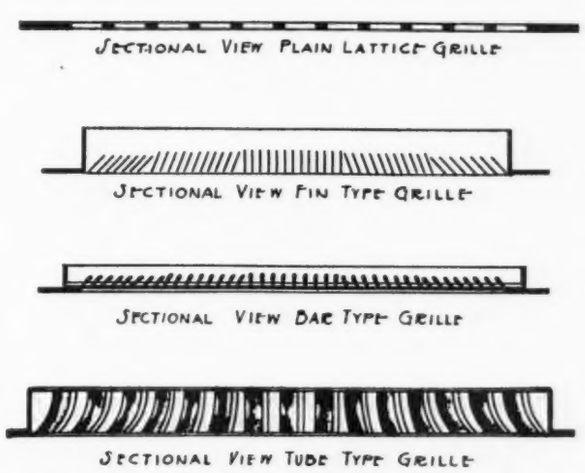

SECTIONAL VIEW PLAIN LATTICE GRILLE
SECTIONAL VIEW FIN TYPE GRILLE
SECTIONAL VIEW BAR TYPE GRILLE
SECTIONAL VIEW TUBE TYPE GRILLE

Fig. 2—The above four standard types of warm air register faces were used in the tests.

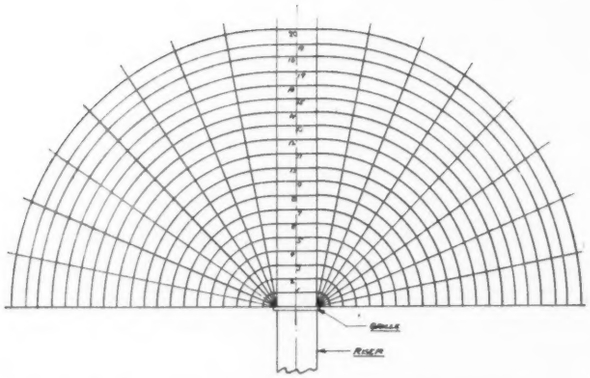


Fig. 3—Lines were drawn on the testing laboratory floor as shown here to determine velocity readings. The numbers are feet.

the entire stream. No attempt was made to record velocities below 50 feet per minute.

Except where otherwise specified on the figures shown, the air temperature is room temperature of 70 degrees. All grille areas were based on the Davies Formula, which is as follows for registers:

$$\text{C.f.m.} = CV \frac{A + a}{2}$$

and for this equation CV is a correction factor to be used for various velocities and anemometers of different sizes, A is the gross area of the grille and a is the net area of the opening through the grille, which is divided by 2 to establish the average or effective area. This formula has been thoroughly covered by papers* presented before the Society on three different occasions.

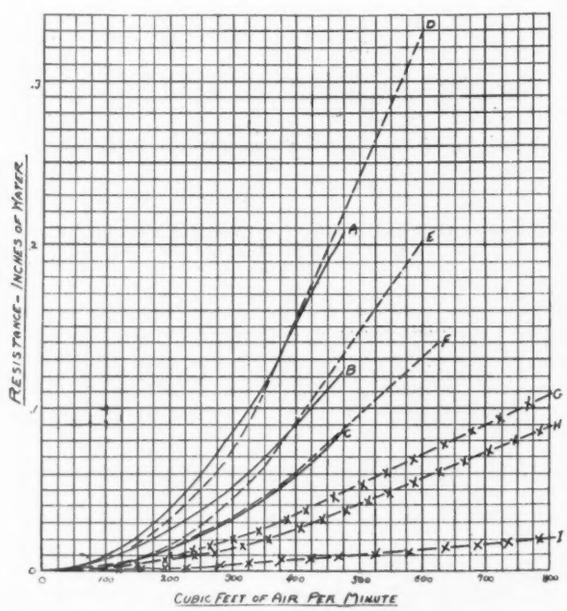
*Measurement of the Flow of Air Through Registers and Grilles, L. E. Davies, A.S.H.V.E. TRANSACTIONS, Vol. 36, 1930; Vol. 37, 1931; A.S.H.V.E. JOURNAL (*Heating, Piping and Air Conditioning*), Sept. 1933.

Noise

As mentioned before, suitable apparatus for accurately determining the cause of noise and its level was not available. The noise level for grilles has been considered 35 decibels but this does not take into consideration the pitch or frequency of the noise and this suggests further research be conducted to determine noise and that improvements be made in the present noise level determination equipment. Even without suitable apparatus certain results were obvious from the tests made and are herein mentioned.

In the first place the design and construction of the ducts, particularly the approach, have much more effect on the noise level than the grilles. A velocity up to 1500 feet can be used without air noise with practically any type of grille, using a standing approach, and by standard approach reference is made to a right angle turn between the duct and the grille with a change in dimension so the perimeter of the grille flange is larger than the perimeter of the duct, commonly called a riser, to allow slower outlet velocity. It is very difficult to eliminate noise in an air conditioning system with a duct velocity of over 2000 feet, which would be necessary if a velocity of 1500 feet were recorded at the grille. A velocity of 1700 feet can be used with perforated grilles, provided the fret work of the grille is not over ¼ inch wide. A velocity of 1500 feet can be used with a fin, tube or bar type grille without causing objectionable noise if the rear surface is flush instead of indented.

Much of the noise caused by the approach can be reduced by the use of turning blades, which allow an increase of 300 feet for the velocities mentioned, without increasing the noise caused by the grille. A properly designed combined approach, turning blades and grille in one unit has been constructed that permits velocities as high as 3500 feet without objectionable



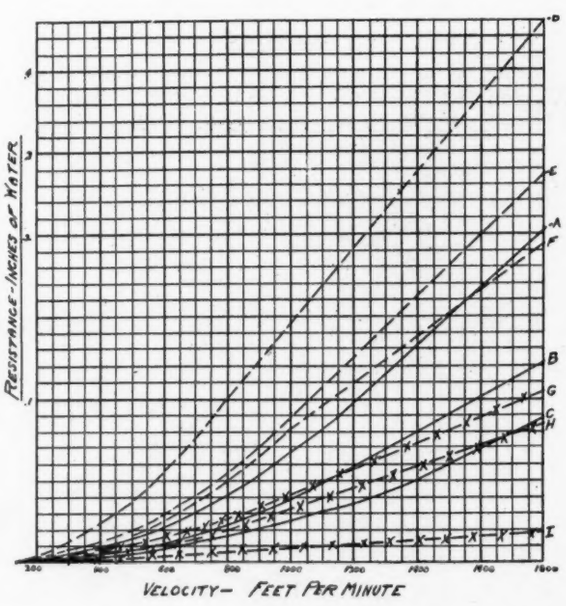


Fig. 4 and 5—The lines on these two charts show the resistance of the various registers and grilles and of the duct only, based on cubic feet of air per minute (Fig. 4) and velocity in feet per minute (Fig 5), respectively. The various types are designated by letters as follows: A—perforated grille and duct; B—perforated grille only; C—duct only; D—fin, bar or tube grilles and duct; E—fin, bar or tube grilles only; F—duct only; G—tube grille, turning blades and duct; H—tube grille and turning blades; I—turning blades and duct.

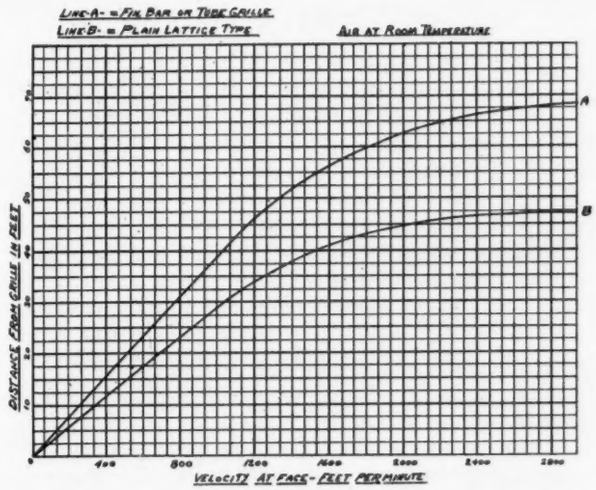

LINE A- = FIN BAR ON TUBE GRILLE
LINE B- = PLAIN LATTICE TYPE
AIR AT ROOM TEMPERATURE
DISTANCE FROM GRILLE IN FEET
VELOCITY AT FACE - FEET PER MINUTE
A
B

Fig. 6—Graph showing the linear feet of air carry for two types of grilles at velocities from 0 to 2800 feet per minute.

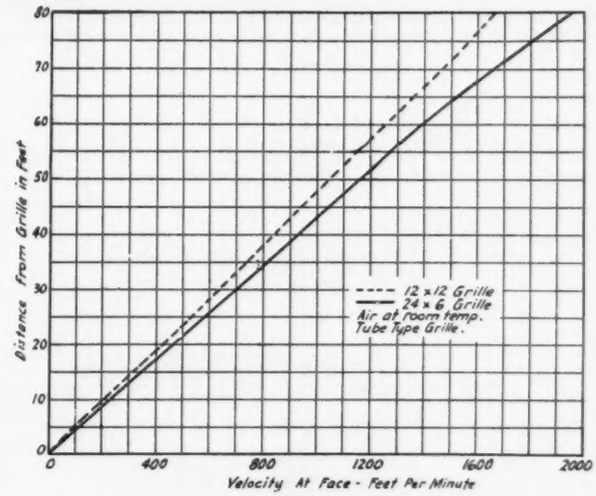


Fig. 7—Graph showing the air carrying capacity of two grilles of same type and area, but of different proportions.

noise because the air turbulence in the approach and grille was eliminated.

Resistance

Figs. 4 and 5 show the resistance of various types of grilles, and of the duct only, based on cubic feet of air per minute and velocity in feet per minute, respectively.

All grilles used for the tests were 12x6 inch, the construction of the grilles being shown in Fig. 2.

The Figs. 4 and 5 indicate that the resistance caused by the grilles will never exceed 10 per cent of the total resistance of the system, and that therefore grille resistance is of relatively small importance.

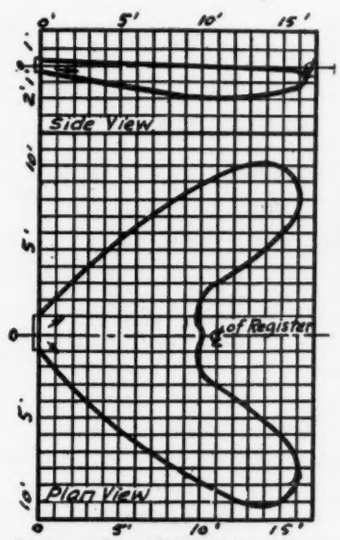
Volume

A change in the net free area of a grille does not have a corresponding effect on volume. For example,

(*Continued on page* 41)

Figs. 8A, 8B, 8C, 8D show dispersion of air outward, downward and upward for several types of grilles. Captions explain various types. Air at room temperature.

Fig. 8-A


Side View
of Register
Plan View
Distance from Grille Face in ft.
AIR STREAM-WITH TUBE-TYPE GRILLE
2" AT 45° LEFT-3" AT 45° LEFT TO 5° LEFT
1" STRAIGHT-3" AT 45° RIGHT TO 5° RIGHT-2" AT 45° RIGHT.

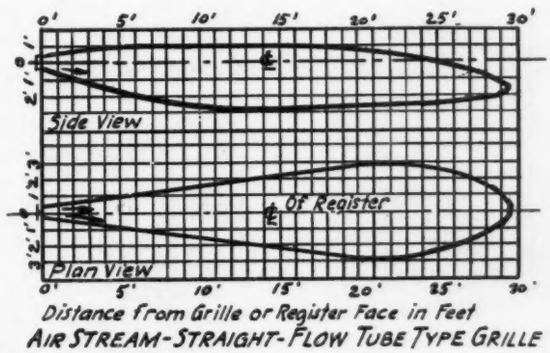


Fig. 8-B

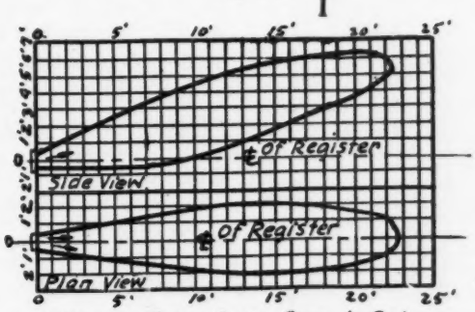


Fig. 8-C

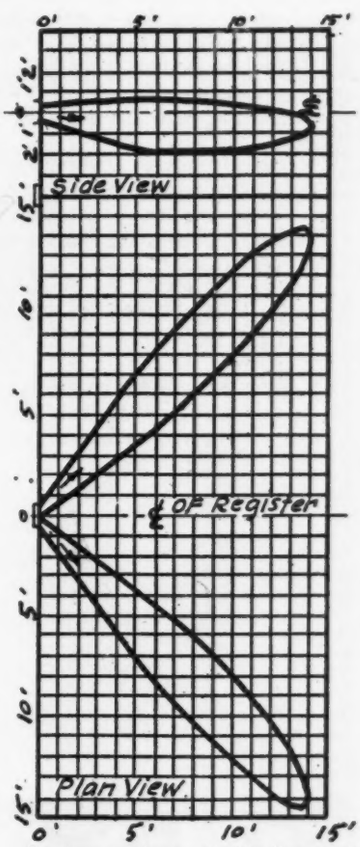

Side View
of Register
Plan View
Distance from Grille Face in ft.
AIR STREAM-WITH TUBE TYPE GRILLE
5½" AT 45° LEFT & 5½" AT 45° RIGHT

Fig. 8-D

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Since something called "air conditioning" is being advertised and sold to the public, it is in the interest of both fair competition and the public that there be a mutual understanding of what this term means. For this reason the National Better Business Bureau has made a careful inquiry into the subject with a view toward defining air conditioning for the guidance of all who are interested in maintaining public confidence in advertising.

Manufacturers, architects and engineers say that "air conditioning," generally speaking, is the scientific preparation and simultaneous control of such factors as temperature, humidity, motion, distribution, dust, bacteria, toxic gases and ionization. The three factors which probably affect human comfort to the greatest degree are temperature, humidity and motion of the air. It is the simultaneous control of these three factors which scientific authorities agree constitutes the minimum requirements for air conditioning. Because the functions performed for air conditioning in the summer differ from those required in winter and because units are offered to the public which produce air conditioning in the summer, but not in the winter and vice versa, the following classifications and minimum requirements of air conditioners have been adopted by the trade, scientific authorities and the Nat'l Better Business Bureau.

Summer Air Conditioning should perform, as a minimum, the following functions:

(1) cool the air,
(2) dehumidify the air,
(3) circulate the air.

Winter Air Conditioning should perform, as a minimum, the following functions:

(1) heat the air,
(2) humidify the air,
(3) circulate the air.

Year-Round Air Conditioning should perform, as a minimum, the following functions:

(1) cool and dehumidify the air in summer,
(2) heat and humidify the air in winter,
(3) circulate the air.

It is understood that the functions required by the season of the year are performed automatically and simultaneously to meet the specific minimum requirements of the user.

The Bureau requests the cooperation of all interested in fair advertising in eliminating the use of the term "air conditioning" or "air conditioner" or "air conditioned" to describe such articles as fans, humidifiers, odor absorbers, underwear, hats, etc. Loose terminology of this nature may not necessarily deceive the public but it paves the way for a manufacturer who may wish to "cut corners" to offer to the public air conditioning equipment which does not perform the minimum functions of air conditioning as generally understood by the trade; justify his deception by claiming that the term "air conditioning" has no exact scientific meaning.

Research Residence Facts

(*Continued from page 29*)

(e) Loss through warm-air ducts.
(f) Loss through warm-air register.
(g) Loss due to discarding velocity head at register.

7. It may be noted from a study of the seven divisions listed in item 6 that the discussion will be simplified if we group together similar items that exist on both the suctions and the pressure sides of the system. For instance, it will be convenient to combine certain items together and list them under the following classifications:

Items "a" and "f" as Register losses.
Items "b" and "e" as Duct losses.
Item "c" as Filter and coil losses.
Item "d" as Casing loss.
Item "g" as Loss of velocity head.

The discussion which follows will consist of a presentation of data from the Research Residence plant, which will be followed in the following issue by a more detailed study of pressure losses through various parts of a typical duct system.

Research Residence Data

In the upper part of Fig. 5 is shown a line diagram of the duct system in the Research Residence which was used in the study of the determination of pressure losses.

The objects of this study were (1) to compare the

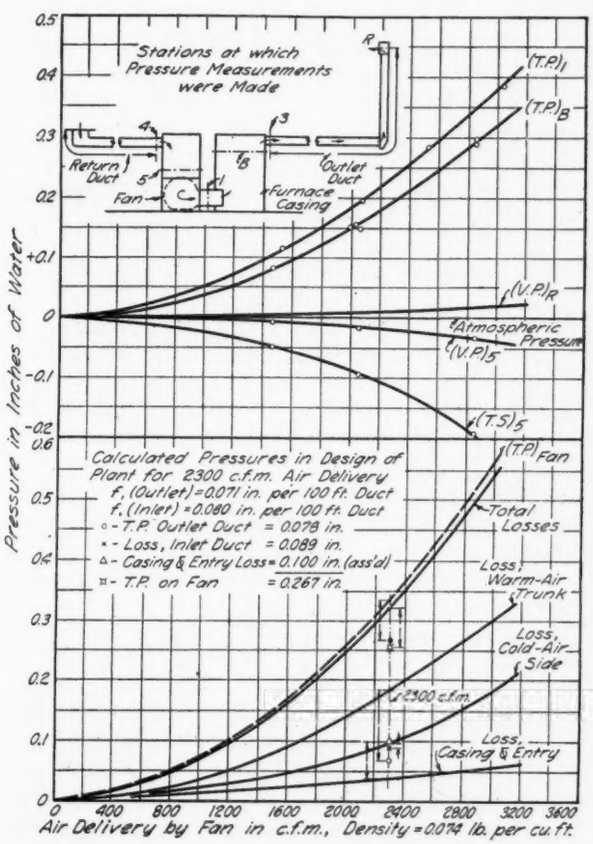
Stations at which Pressure Measurements were Made
Return Duct
Fan
Furnace Casing
Outlet Duct
(T.P.)1
(T.P.)B
(V.P.)R
Atmospheric Pressure
(V.P.)5
(T.S)5
(T.P) Fan
Total Losses
Loss, Warm-Air Trunk
Loss, Cold-Air Side
Loss, Casing & Entry
Calculated Pressures in Design of Plant for 2300 c.f.m. Air Delivery
f, (Outlet) = 0.071 in. per 100 ft. Duct
f, (Inlet) = 0.080 in. per 100 ft. Duct
○ - T.P. Outlet Duct = 0.078 in.
× - Loss, Inlet Duct = 0.089 in.
△ - Casing & Entry Loss = 0.100 in. (ass'd)
⌗ - T.P. on Fan = 0.267 in.
2300 c.f.m.
Pressure in Inches of Water
Air Delivery by Fan in c.f.m., Density = 0.074 lb. per cu. ft.

Fig. 5—Actual and calculated pressure losses in the forced air trunk duct system in Research Residence. See also Fig. 1 for method of presentation.

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actual total head on the fan with the total head calculated from the conditions assumed for the design of the plant; and (2) to separate the pressure losses for the three parts of the system, consisting of the cold air side, the furnace and casing, and the warm air side; and to compare these separate losses with the ones calculated or assumed for the design of the system.

By changing pulleys on the motor and fan, the speed of the fan was adjusted to give a number of successive steps in the cu. ft. of air delivered ranging from 1000 c.f.m. to 3000 c.f.m For each given fan speed the combustion rate of the furnace was controlled to maintain a constant temperature of approximately 135 deg. F. for the air in the ducts. No attempt was made to control room temperatures and no observations of house data were made. By means of a Pitot tube and an inclined manometer or Wahlen gage, a number of observations were made of the static and total pressures in the furnace bonnet, at the fan outlet just outside of the furnace casing, and in the cold air junction box just before the entry to the fan. The locations of these stations are shown as B, 1, and 5 respectively on the diagram inserted in Fig. 5.

From the discussion in the preceding articles, it is apparent that in the case of the forced-air system, involving many changes in cross section and hence many changes in velocity, the static pressures at any given section are comparatively meaningless unless interpreted in the light of the previous changes in velocity. Such interpretations are usually devious and complicated. Differences in total pressure can be directly interpreted in terms of both friction and shock losses. The analysis of the forced-air system has therefore been confined to a consideration of the total pressures and pressure losses in the different parts of the system, and no attempt has been made to interpret the losses in terms of static pressures at various sections.

Pressure Losses

The observed pressures at Stations 5, 1, and B plotted against the air delivery of the fan are shown in the upper curves in Fig. 5. In designating these curves, (TP) represents the total pressure measured by the dynamic part of a Pitot tube, (TS) the total suction or depression measured by the static part of the Pitot tube, and (VP) the velocity pressure measured by the combined readings of the dynamic and static parts of a Pitot tube.

The curves for the observed data are not directly comparable with the pressures assumed and computed for the design of the system, but form the basis for the derived curves, shown in the lower part of Fig. 5, which are directly comparable with the design data. See also Fig. 1 for method of presentation.

Briefly summarized these *design* pressures in inches of water were: total on warm air side at bonnet, including entry loss at bonnet, friction and shock losses in duct system, and outlet velocity pressure at register = 0.078. Friction and shock losses in inlet duct = 0.089. Assumed loss through casing, including entry loss to casing = 0.100. The total head on the fan, consisting of the sum of all losses and the final velocity pressure at the registers, represented by the

sum of the preceding values, was 0.267 inch of water, and the final velocity pressure at the registers was 0.010 inch of water. These values have been plotted as the points at 2300 c.f.m. air delivery shown in the lower part of Fig. 5.

Total Pressure on Fan

The curve for (TP) on the fan was derived by substituting values read from the upper set of curves shown in Fig. 5, in the equation:

$$(TP) \text{ on fan} = (TP)_1 + (TS)_5 - (VP)_5 \quad (1)$$

The curve for total losses on the system was then derived by use of the equation:

$$\text{Total losses} = (TP) \text{ on fan} - (VP)_R \quad (2)$$

From these curves it may be noted that at the delivery of 2300 c.f.m. on which the design of the plant was based, the *actual* total pressure on the fan was higher than the calculated total pressure. The former was 0.335 inch while the latter was 0.267 inch of water, or the pressure used for design was 80 per cent of that actually obtained in operation.

The same was true for the total losses, the corresponding values being 0.324 and 0.257 in. This condition was undoubtedly brought about by the use of dampers to balance the plant, and accounts for the fact that the actual air delivery at the rated speed of 440 revolutions per min. of the fan was 2100 c.f.m. instead of 2300 c.f.m. Since dampers are necessary, this condition can be taken into consideration either by making some allowance in the total pressure used for the design of the plant, or by allowing the plant to adjust itself, after installation, to slightly higher register air temperatures than those assumed for the design.

Pressure Losses in Ducts

The curve for pressure losses in the warm air trunk system was derived by substituting values from the upper curves in equation:

$$\text{Loss in warm air trunk} = (TP)_B - (VP)_R \quad (3)$$

The loss in the cold air side was obtained by use of equation:

$$\text{Loss in cold air side} = (TS)_5 - (VP)_5 \quad (4)$$

comparing the actual losses with the calculated losses for the two sides of the system at an air delivery of 2300 c.f.m. it may be noted that on the warm air side the actual loss was 0.185 inch and the calculated loss was 0.078 inch, while on the cold air side the actual loss was 0.100 inch and the calculated loss was 0.089 inch of water. That is, on the warm air side the loss used for design was 42 per cent of the actual loss, and on the cold air side it was 89 per cent.

Hence it is evident that the influence of certain elements of uncertainty was greater on the warm air side of the system than it was on the cold air side. The dampers were a disturbing influence, the effect of which could not be estimated in advance. In addition, the nature and amount of shock losses could not be predicted with any degree of accuracy. Shock losses occur with every change of air velocity and with every change in the direction of the air stream. Such changes in velocity take place at the changes in area of the duct section. They vary from a small fraction to approximately one-half of the velocity pressure existing

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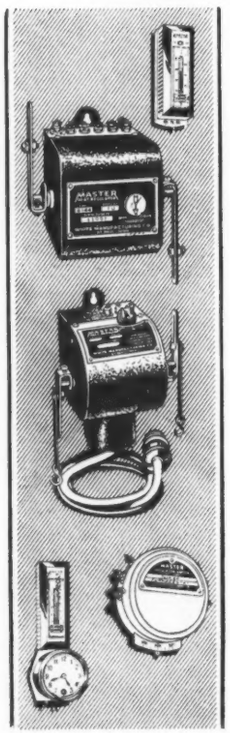

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before the section, and are largely indeterminate shock losses. Furthermore, if extreme variations in the velocity at the different portions of a register face occur, the actual average velocity pressure at the face is higher than the velocity pressure calculated from the average velocity. Advance estimation unfortunately must be based on the probable average velocity at the register face. All of these factors enter into the operation of the plant after it is installed and render complete and exact advance estimation of the pressure losses practically impossible.

Pressure Loss Through Casing

The curve for loss through the furnace and casing, including the entry loss to the casing, was derived by substituting values from the upper curves in equation:

$$\text{Loss through casing} = (TP)_1 - (TP)_B \qquad (5)$$

The actual loss in this case was 0.040 inch of water as compared with 0.100 inch which was assumed for the purpose of design, or the actual loss was only 40 per cent of that assumed. This loss also could not be estimated in advance, and might easily have an order of magnitude comparable with the entire loss on either the warm air or cold air side of the system. It, therefore, may assume an important part in the uncertainty of advance estimates of the pressure loss.

Summary

Briefly summarized, the results from the Research Residence tests were as follows:

1. *Pressure Losses* at 2300 c.f.m. air volume.

	Design Conditions	Actual Conditions
a. Inlet duct	0.089 in.	0.100 in.
b. Casing loss.....	0.100	0.040
c. Outlet duct.....	0.078	0.185
d. Velocity pressure at register.....included in c.		0.010
e. Total pressure on fan	0.267 in.	0.335 in.

2. The total pressure used for design was 80 per cent of that actually obtained in operation. The losses on the warm air side were considerably underestimated, and the loss through the furnace casing was somewhat overestimated. In the design of similar plants it might be advisable to increase the calculated "losses in the warm air ducts" by 100 per cent to allow for the effect of dampers and indeterminate shock losses.

3. It is considered that a mean value of approximately 0.05 in. of water for the pressure loss through the casing, when the latter is not baffled nor unusually small, would be a good design value. For baffled furnaces a value of from 0.07 in. to 0.10 in. is suggested for use.

4. Owing to the presence of shock losses, the magnitudes of which are largely uncertain, complete and exact advance estimation of the pressure losses in a forced-air system is practically impossible, and the actual pressures under which the plant operates may differ considerably from the predicted or esti-

(*Continued on page* 48)

Characteristics of Registers

(*Continued from page* 35)

a 10 per cent reduction in the net area will reduce the volume approximately only 5 per cent provided the net area of the grille remains over 50 per cent.

Air Flow

By air flow is meant the distribution of incoming air into the room. This involves the distance the air travels, and the direction and shape of the air stream. It is obvious that the correct distribution of the incoming air is an important factor in the comfort of the occupants of the room and it is perhaps in connection with air flow that grilles assume the greatest importance. It is also in connection with air flow that the performance of different types of grilles varies the most.

There is no one type of grille which is suitable for all conditions. Much depends on the location of the grille, size of the room, velocities used, temperature of the incoming air and other factors. The characteristics of various types of grilles will be explained in order to assist in selecting the proper type to be used under whatever conditions exist on the installation.

The length of the air stream is governed primarily by the velocity of the air; secondly, by the type of grille; and thirdly, by the proportions of the grille. Fig. 6 shows the air carry for two types of grilles of the same size at various velocities.

Fig. 7 shows the air carry for two grilles of the same type and area but of different proportions.

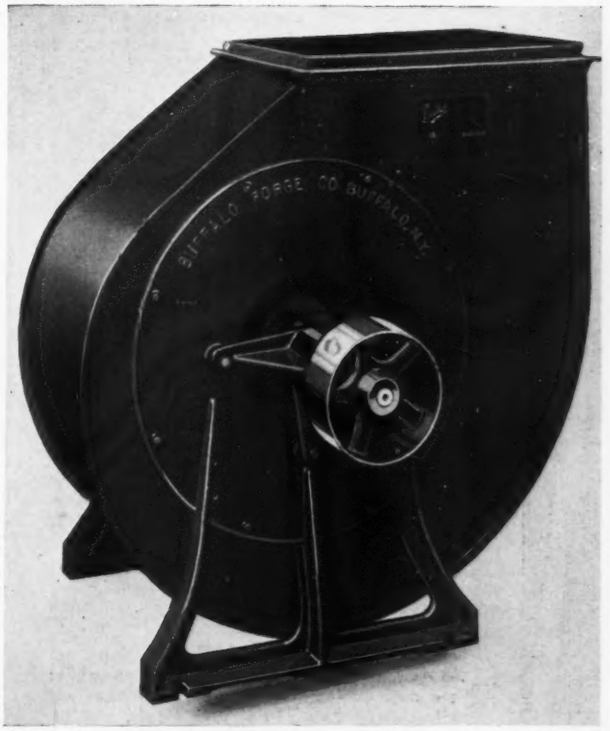
The results shown in Fig. 7 indicate that the air will travel further with a grille having a smaller perimeter than one having a large perimeter, other conditions being the same.

The direction and shape of the air stream is very materially affected by the type of grille and also by the nature of the approach. If it is desired to project the air on a horizontal plane, it is necessary to either use turning blades in the approach or else use a grille having horizontal bars or fins of sufficient depth to guide the air horizontally. The air can be readily directed to the left or right by means of the grille, provided that the bars or fins of the grille are sufficiently deep. Figs. 8A, 8B, 8C, 8D show the air flow with various types of grilles.

It will be noted that the results shown in Figs. 8A, 8B, 8C, 8D are based on the air leaving the grille being at the same temperature as the room air. This was done in order to isolate the effect of the grille from all other factors. In actual use the incoming air is almost always at a different temperature than that of the room air. Fig. 9 shows the effect which the temperature differential has on the rise or fall of the air at various velocities.

From the charts shown on Figs. 6, 7, 8, and 9 it is obvious that by using the proper velocity with the proper type of grille, the air flow can be controlled as desired with considerable accuracy.

Another factor entering into the distribution of the air in a room is the effect which the incoming air has on the air already in the room. This is called the aspiration factor. Information regarding this has not been sufficiently developed to be presented at this time. It is a subject worthy of much additional study.



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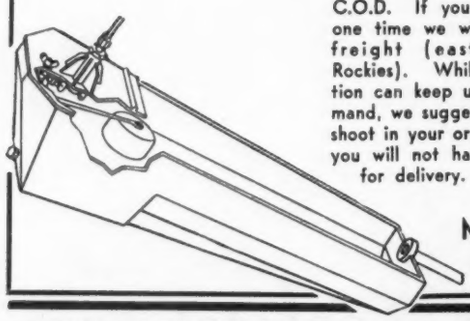

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Appearance

What constitutes an attractive looking grille is a matter of opinion. Many attempts have been made to make grilles pleasing to the eye and in other cases attempts have been made to make grilles as inconspicuous as possible. At the present time many developments are under way to combine grilles and lighting fixtures so they will furnish direct and indirect lighting and to carry the required amount of air into a space, so designed that they are artistically proportioned and enhance the appearance of any room. It is important that it be impossible to see the duct or approach immediately back of the grille and that the finish harmonizes with the room. They should, of course, be neat and trim looking and installed, where possible, in a frame so they will not streak the walls, which can be accomplished by setting the grille in a frame so the front of the grille is flush with the wall, which causes the air that leaks between the grille and the frame to travel at right angles to the surface of the wall so it will not streak as it often does when the air travels parallel to the wall surface. Installation of grilles is very important and the architect or engineer responsible for the job should insist on this.

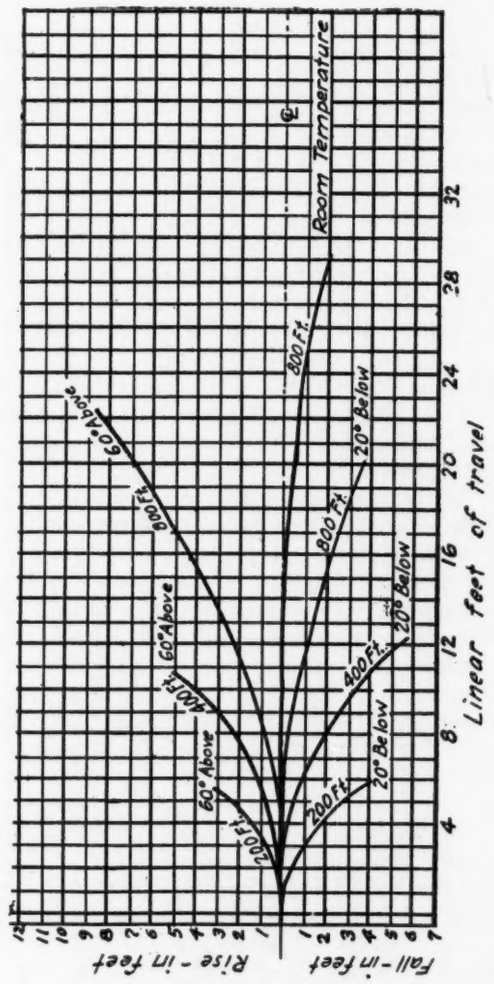

Fig. 9—Graph showing effect on fall and rise of air from registers at different temperatures above and below room temperature and three different register velocities.

Recirculating Air Grilles

Nothing which has been previously said in this paper applies to recirculating air grilles.

Tests have been made which indicate that high velocities may be used through recirculating air grilles without showing an appreciable air movement a few feet away from the grille. With a velocity of 1000 feet through a 12x12 inch grille, for example, the velocity of the air 16 inches away from the grille is less than 50 feet and with a grille 24x24 inch and a velocity of 1000 feet, this velocity is reduced to 50 feet between 24 and 30 inches away from the grille.

Although much is already known regarding the characteristics of grilles, there is ample opportunity for additional research in this field, particularly when the effect various types of grilles and their location have on the air distribution within a room is considered.

Selecting Register Temperature

(*Continued from page* 32)

a heat loss of 54,870 B.t.u. per hour, the air required being 900 c.f.m., all from outside. By one process, he finds the total B.t.u. requirement to be 122,910, with a register temperature of 126.2 degrees.

By applying equations (1) and (4), the solution to this problem becomes:

(1) $\frac{54{,}870}{1.08 \times 900} + 70 = 126.4$ degrees, register temperature.

(4) $900 \times 75.6 + 54{,}870 = 122{,}910$ B.t.u. for heat and ventilation, same as answer given.

But, if a register temperature of say 115 degrees had been considered more expedient, then quation (3) gives corrected c.f.m., thus:

(3) $\frac{54{,}870}{1.08 \times (115 - 70)} = 1106$ c.f.m. at a register temperature of 115 degrees.

If only 300 c.f.m had been required from outside and 600 c.f.m. from inside, then the total B.t.u. would be found by equation (5), thus:

$(300 \times 75.6) + (600 \times 5.4) + 54{,}870 = 80{,}790$ B.t.u. for heat and ventilation.

On page 365 of 1935 A. S. H. V. E. Guide is an example (Example 2) of a room, with a heat loss of 100,000 B.t.u. per hour and 1500 c.f.m.; to find register temperature. The answer given is 131.7° F.

Applying equation (1) the solution becomes:

$\frac{100{,}000}{1500 \times 1.08} + 70 = 131.7$, which is the answer given.

Two or More Rooms

If the building to be heated contains more than one room, and if the amount of outside air is specified, or provided by law, find the register temperature of each room separately. Then take the lowest temperature obtained to be the established temperature for all rooms, and calculate the c.f.m. for each room accordingly.

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Condensation of Moisture

(*Continued from page 27*)

heating effects, higher firing rates are necessary in furnace operation with soft coal than with anthracite or gas, and correspondingly higher flue-gas temperatures result.

In Fig. 5 is shown the relation between indoor-outdoor temperature difference and flue-gas temperatures measured 3 feet below the top of the

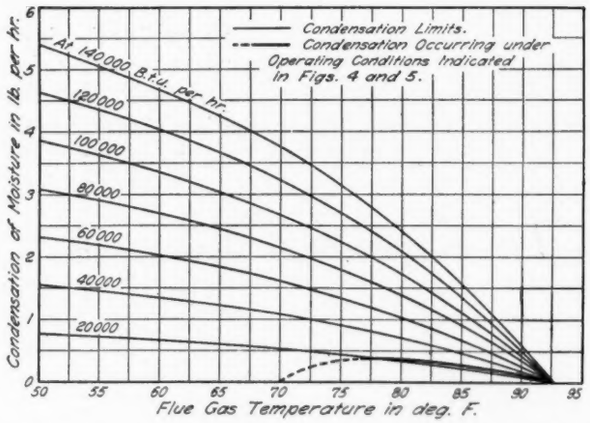

Fig. 6—Condensation of moisture from flue gases for bituminous coal burned with 100 per cent excess air.

chimney. Flue-gas temperatures are highest with soft coal and lowest with manufactured gas.

Condensation in Installation Studied

From the actual relation between firing rate and resulting flue-gas temperature shown in Figs. 4 and 5 it is possible to determine the condensation

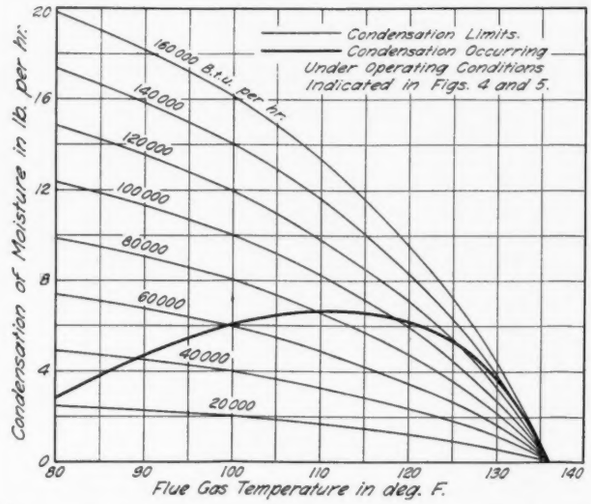

Fig. 7—Condensation of moisture from flue gases for manufactured gas burned with 50 per cent excess air.

to be expected by plotting the intersections of the firing rate-flue-gas temperature relationships on the charts showing condensation limits for various firing rates. This has been done for soft coal in Fig.

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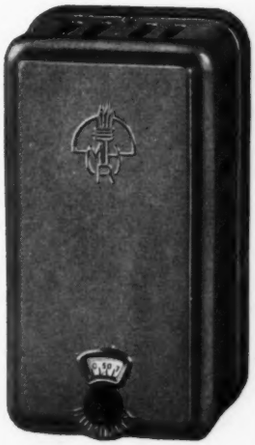

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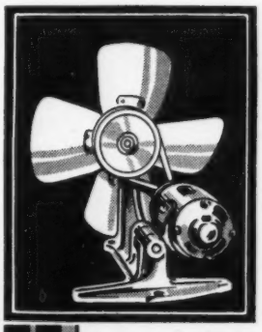

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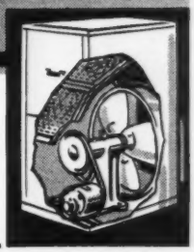

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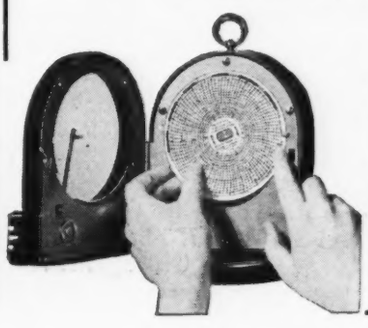

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6, and for manufactured gas in Fig. 7. The data have been replotted against indoor-outdoor temperature differences in Figs. 8 and 9.

No condensation occurs with anthracite because the temperature of the flue gases is never below the dew point. A small amount of condensation may occur with soft or bituminous coal at low firing rates. The flue-gas temperatures in the low range have been obtained by extrapolation of the curves representing experimental data in the higher ranges. A maximum condensation of about 0.38 pound per hour would occur with a firing rate of 20,000 B.t.u. per hour, corresponding to an outdoor temperature of approximately 59 deg. F.

Extremely heavy condensation will occur with manufactured gas but under distinctly different conditions than with coal. With gas, a maximum con-

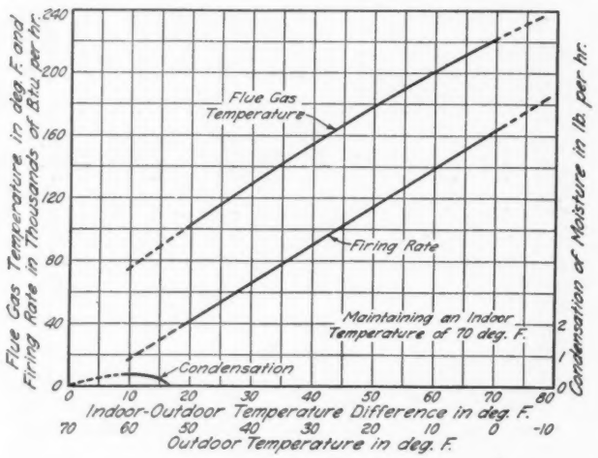

Flue Gas Temperature in deg. F. and Firing Rate in Thousands of B.t.u. per hr.
Condensation of Moisture in lb. per hr.
Flue Gas Temperature
Firing Rate
Maintaining an Indoor Temperature of 70 deg. F.
Condensation
Indoor-Outdoor Temperature Difference in deg. F.
Outdoor Temperature in deg. F.

Fig. 8—Firing rate, flue gas temperature and condensation of moisture for bituminous coal burned with 100 per cent excess air.

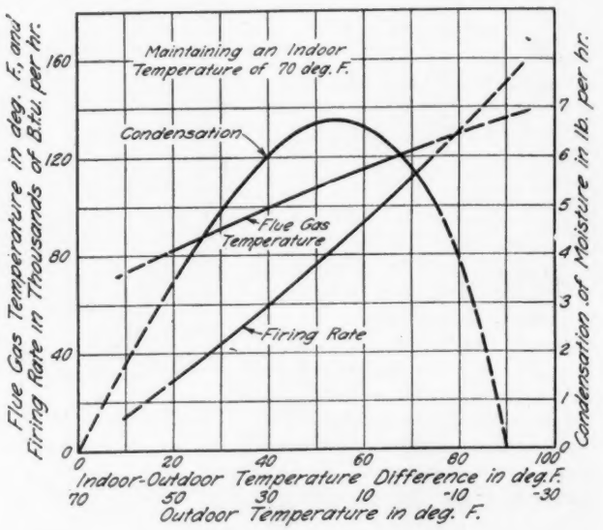
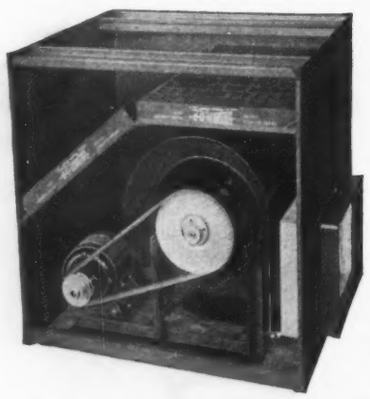

Flue Gas Temperature in deg. F. and Firing Rate in Thousands of B.t.u. per hr.
Condensation of Moisture in lb. per hr.
Maintaining an Indoor Temperature of 70 deg. F.
Condensation
Flue Gas Temperature
Firing Rate
Indoor-Outdoor Temperature Difference in deg. F.
Outdoor Temperature in deg. F.

Fig. 9—Firing rate, flue gas temperature and condensation of moisture for manufactured gas burned with 50 per cent excess air.



QUIET - EFFICIENT - LOW FIRST COST

These are important but more important to the owner is cost of operation. Peerless belt drive blowers are equipped with a motor designed for blower duty. Low current input at start, will not flicker lights. Automatic belt tension device protects motor from overload. Both sides of cabinet removable for easy access to filters.

PEERLESS BELT DRIVE AND DIRECT DRIVE MULTI-SPEED BLOWERS ARE STANDARD EQUIPMENT IN MANY AIR CONDITIONERS. WRITE FOR CATALOG DA33

THE PEERLESS ELECTRIC COMPANY
DEPT. "E" FAN AND BLOWER DIV. WARREN, OHIO

Randall pillow blocks are always in alignment, always perfectly lubricated. Leading manufacturers have standardized on Randall bearings for these reasons. Their installations are quiet and trouble-free.

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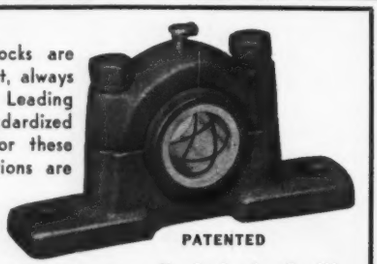

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RANDALL PILLOW BLOCKS

Self-Aligning
Self-Lubricating

RANDALL GRAPHITE PRODUCTS CORP.
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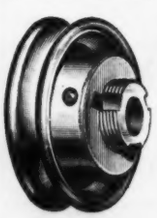
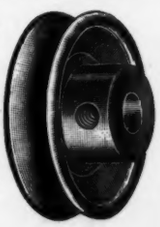
MAUREY PULLEYS PULL SALES



Contractors look to see that Maureys are standard equipment on the air conditioning equipment they handle. They know that there will be no sales resistance on the pulley score, and that there will be no complaints on service.



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THE WISCONSIN HUMIDIFIER

is neither "Drip" nor "Float" type. It is the ONLY HUMIDIFIER that supplies moisture AUTOMATICALLY in CORRECT PROPORTION to the heat generated. Easy to install—No service calls. Not affected by Hard Water or changes in Water Pressure.

Operates equally well with any Fuel. Will improve any Warm Air System.

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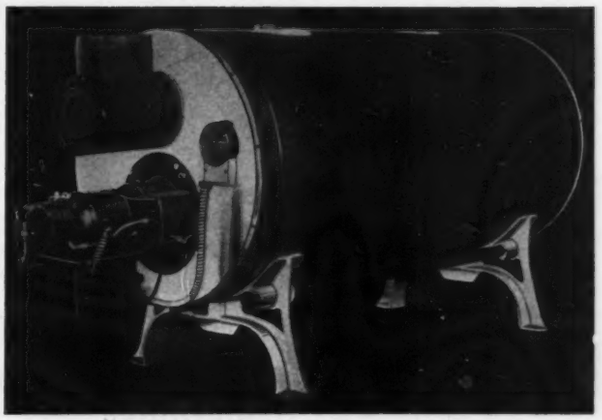

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hot water heater—efficient, economical.

50 to 75%
savings over gas in most communities.

BURNS
No. 1, No. 2 or No. 3 Fuel Oil.

EASY TO INSTALL
controls, combustion chamber, storage tank all assembled at factory.

BURNER CAPACITY
one to two quarts of oil per hour.

The NU-WAY CORPORATION
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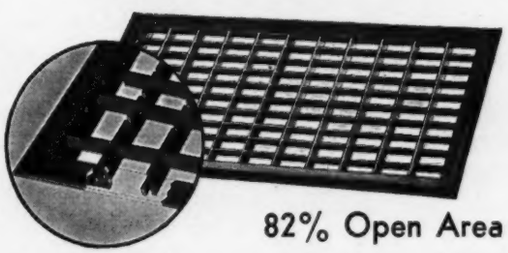
INDEPENDENT "Fabrikated" COLD AIR FACES AND REGISTERS



82% Open Area

Besides the practical features of greater strength and larger open area, "Fabrikated" construction is modern in design and takes the most beautiful finishes. Made in standard and close mesh, any size, any finish.

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MONARCH NOZZLES

FOR OIL

Monarch Fig. F-27 stainless steel atomizing nozzles have been proven superior not only by laboratory test but by actual service on thousands of burners.

FOR AIR CONDITIONING

Monarch ¼" Fig. H-261 male or Fig. 642 female pipe thread brass nozzles are recommended. Capacities from .57 to 18.17 G.P.H. at 40 lbs. The 2.20 gal. size at 25 lbs. is mostly used.

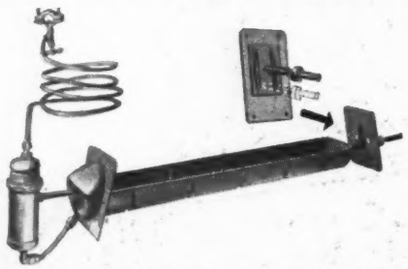
Write for Bulletin No. 20

Fig. F-27

¼"
Fig. H-261

MONARCH MFG. WKS. INC.
3303 SALMON ST., PHILADELPHIA, PA.

We Promised It and Here It Is!—*Built of Bronze*



The 85CH MAID-O'-MIST HUMIDIFIER
For Warm Air Furnaces

1. Bronze is rated as 60% more efficient in heat transmission than aluminum and 10 times more than steel or cast iron of the same thickness at 212° Fahrenheit.
2. The patented adjustment plate makes it adaptable to various size furnaces and to prevent over saturation in zero weather.
3. Automatically fed by a WATER-BOY safety feeder—located outside of furnace, away from heat, to avoid corrosion.

The low price will surprise you.

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Latest Performance Data and Price Sheet

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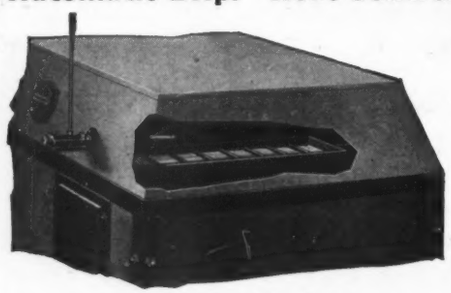
1805 N. Kostner Ave., Chicago, Ill.

AN AUTOVENT PRODUCT

The Humidifier that Satisfies is the Automatic Drip. Heat Controlled.



Made in Sizes for All Furnaces

—

New Low Prices

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Also a Humidifier for Steam and Hot Water Plants

Send for Catalog

Automatic Humidifier Co., Cedar Falls, Ia.

densation of about 6.75 pounds per hour would occur with a firing rate of 84,000 B.t.u. per hour, corresponding to an outdoor temperature of approximately 15 deg. F.

The maximum condensation for soft coal, then, will occur in mild weather, while for the gas the maximum condensation, approximately 18 times the maximum for soft coal, will occur when the outdoor temperature is about 15 deg, F. above zero.

Elimination of Seepage

Data for oil and for natural gas which would be directly comparable with the foregoing results are not available.

Gas-fired furnaces are usually automatically operated and thermostatically controlled, so that large fluctuations in combustion rate and flue-gas temperature, such as would occur with hand-fired coal furnaces, are eliminated. Flue-gas temperatures with gas are also considerably lower than with coal. In zero weather the flue gas temperature at the smoke collar of the furnace was 570 deg. F. for anthracite, 780 deg. F. for soft coal, and 430 deg. F. for gas. At the roof line, 3 feet below the top of the chimney, the flue-gas temperature was 180 deg. F. for anthracite, 220 deg. F. for soft coal, and 125 deg. F. for gas.

Because of the less severe temperature conditions in the flue when gas is used as fuel, vitrified impermeable liners, provided possibly with sockets, could be used without much danger of breakage or disintegration. Such liners would eliminate seepage, and for this reason it would be necessary to make provision for drainage of the condensate from the chimney.

Konzo, Pressure Losses

(*Continued from page* 40)

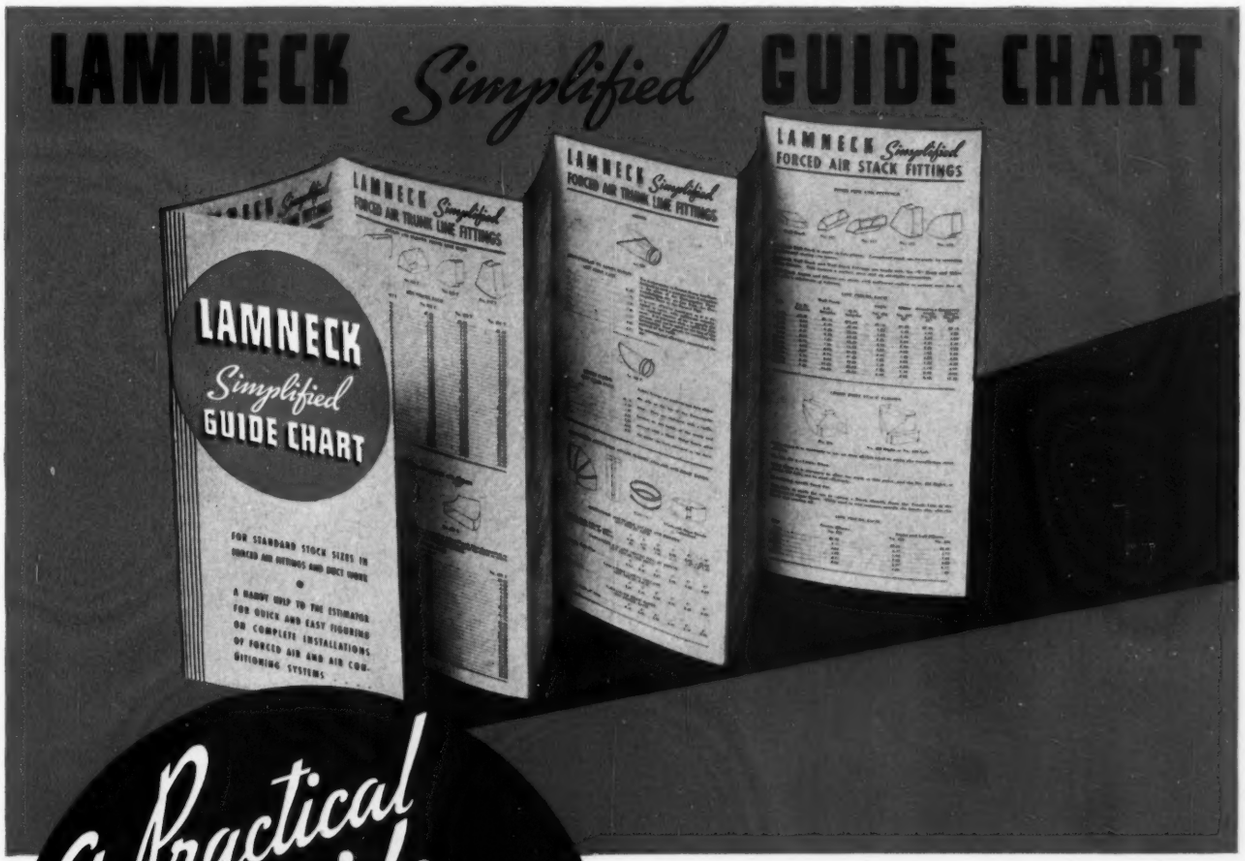
mated pressures on which the design of the plant was based.

5. The actual pressures under which the plant operates may differ considerably from the predicted or estimated pressures on which the design of the plant was based, without impairing the usefulness of the plant or preventing satisfactory adjustment and operation.

6. In the design of a forced-air heating system a generous allowance should be made for the effect of dampers, particularly on the warm-air side. Such dampers may have to be set to offer a very high resistance in some of the worst or longest runs to take care of an unforeseen condition introduced by a poor branch.

In the next article of this series Mr. Kongo will present actual resistances as found throughout an actual system. The information will dispel many erroneous ideas on the amount of friction and where it occurs. Watch for the article.

LAMNECK *Simplified* GUIDE CHART


LAMNECK Simplified
FORCED AIR TRUNK LINE FITTINGS
LAMNECK
Simplified
GUIDE CHART
FOR STANDARD STOCK SIZES IN FORCED AIR FITTINGS AND DUCT WORK
A HANDY HELP TO THE ESTIMATOR FOR QUICK AND EASY FIGURING ON COMPLETE INSTALLATIONS OF FORCED AIR AND AIR CONDITIONING SYSTEMS
LAMNECK Simplified
FORCED AIR TRUNK LINE FITTINGS
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FORCED AIR STACK FITTINGS

A Practical Guide

TO SAVINGS OF TIME and MONEY

IT'S FREE

HERE'S a new chart, handy as your hip pocket for everyone figuring forced air and air conditioning. Simplifies estimating. At a glance you tell standard sizes and prices. Simple, easy and accurate.

This chart covers 98 per cent of all fittings required. For the few specials occasionally specified equivalent areas are easily worked out by substituting standard stock sizes of corresponding dimensions. Our friends in the industry told us what they needed and we did our best to deliver. Besides its everyday usefulness, this guide shows our big stock of standard sizes, now all ready for prompt delivery at big savings plus STANDARD LAMNECK QUALITY. All reports indicate we generally save 30% of installation cost (labor and material). Get this handy guide free. Save yourself work, time and money. Ask for all the copies you want. Here's a tip! Get your architectural and engineering specification friends using this manual. It will cut your estimating time to the bone. That's money in your pocket.

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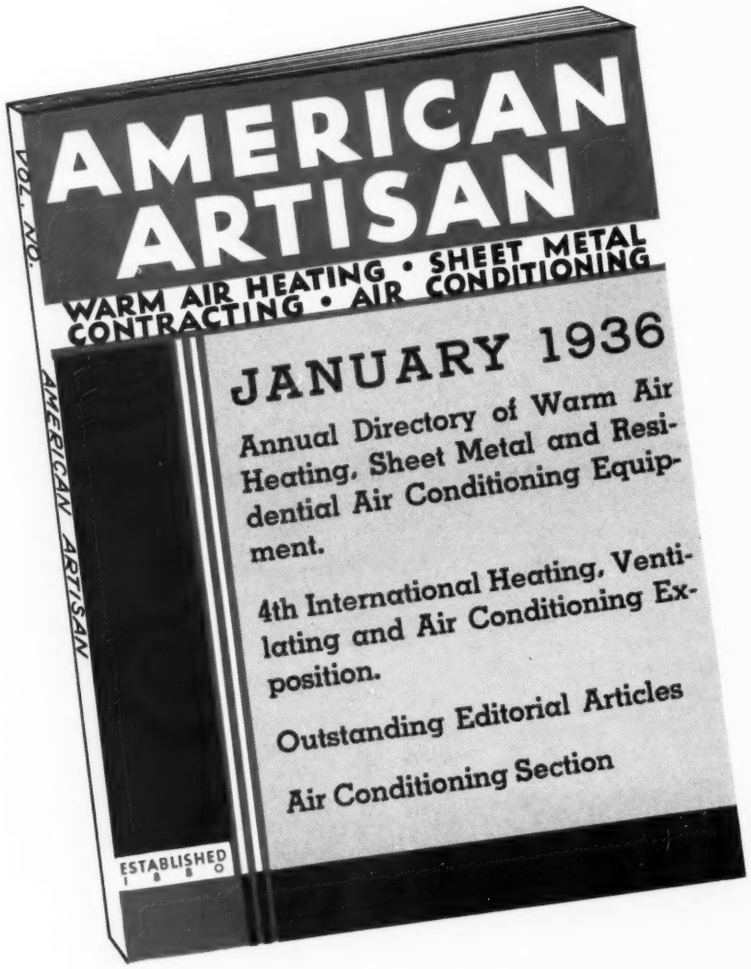
The Buying Guide of the Industry
The "Show Number" of the Industry
The biggest and most valuable single issue
ever published by AMERICAN ARTISAN


AMERICAN ARTISAN
WARM AIR HEATING • SHEET METAL CONTRACTING • AIR CONDITIONING
JANUARY 1936
Annual Directory of Warm Air Heating, Sheet Metal and Residential Air Conditioning Equipment.
4th International Heating, Ventilating and Air Conditioning Exposition.
Outstanding Editorial Articles
Air Conditioning Section
ESTABLISHED 1880
VOL. NO. AMERICAN ARTISAN

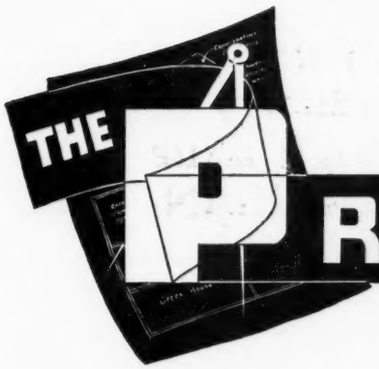
You already know the value of AMERICAN ARTISAN'S Annual Directory Number. This 1936 edition will be the fourth you have received. The big Directory Section has been completely revised and brought up to date for 1936 use. It will be the full answer to your annual need for a buying and reference guide.

In this same issue you will find a special section devoted to the industry's big week in Chicago, January 27 to 31 . . . the 4th International Heating, Ventilating and Air Conditioning Exposition; the annual winter meeting of the National Warm Air Heating and Air Conditioning Association; the 42nd annual convention of the American Society of Heating and Ventilating Engineers. It will be your guide to the valuable and interesting features this big week will provide.

These two special sections will be in addition to an outstanding array of editorial articles on every phase of the warm air heating, air conditioning and sheet metal field.

The issue will be in your hands on or about January 15. It will be bound in a special heavy cover to withstand the wear and tear of the constant use you will give it throughout 1936. It will be packed with the advertising of leading manufacturers in the industry. Watch for it!

Manufacturers: If you have not yet made your reservation, wire at once.
This issue is the outstanding advertising "buy" of the year.



PROBLEM CORNER

Baffling

American Artisan:

I have read your recent articles covering the baffling of casings when converting gravity furnaces to forced air. The furnace manufacturers seem to think that it is best to employ an inner lining to bring the air in closer contact with the prime heating surfaces. However, where it is not desired to have full forced air circulation, but only booster operation allowing gravity to take care of the heat supply a great portion of the time, I believe that the inner liners will tend to choke the flow unless we leave from 8 to 10 inches space between liner and castings as suggested by Mr. Hunt in your July issue.

What sort of a baffle would you suggest for a cast iron furnace? Some persons are recommending a top shield as shown in an attached sketch and claim that this baffle throws all the air together. Is such a baffle satisfactory?

C. Z., Iowa.

Reply by The Editors

Articles showing suggested methods for baffling top radiator cast iron furnaces were published in November and in this issue. You will find several suggestions of importance.

You understand, of course, that there is really no method whereby a furnace can operate with equal efficiency on both gravity operation and mechanical circulation. If it is desired to use both types of circulation then a compromise must be made and the casing must not be baffled as close to the prime heating surface as when straight mechanical heating is employed; nor should the baffle be as far from the prime heating surface as when straight gravity flow is to be used.

Just where a dividing point occurs will depend upon the type of furnace and its operating characteristics. So far as we know, this must be determined by each contractor for the particular make of furnace he handles. Furthermore, it is probable that the distance of the baffle from the prime heating surface will vary with the firepot size of the furnace, the make of furnace, and the collection of apparatus used on each job.

The top shield, which you suggest, has been used by a number of contractors who report fairly good results. Generally speaking, the area of the circle in the baffle is equal to or just slightly larger than the area of all the round pipe leaders taken off the bonnet.

◆

Figuring B.t.u.

American Artisan:

Will you please tell me if there is any short cut method for estimating the B.t.u. loss of a building?

W. T., Ohio.

Reply by The Editors

We do not recommend any short-cut method excepting as you may use it to answer the customer's question "How much." We certainly would not recommend any so-called short-cut method for determining the actual heat losses when you come to plan the installation.

If you want a so-called short-cut method for rough estimating, use the following:

"Multiply the square feet of glass by 1.1; divide the square feet of wall minus glass by 3.0; divide the square feet of ceiling where under a roof by 5; divide the square feet of floor over any unheated space by 3; divide the cubic feet (length times width times height) by 25; add these figures and multiply the sum by the designed temperature difference."

You will then have the Btu per hour required at the furnace.

With reference to the temperature difference, this will be determined by your particular conditions. For the northern half of Ohio you will probably design from 0 to 70 degrees or a temperature rise of 70 degrees; for southern Ohio probably 10 above 0 to 70 degrees is satisfactory or a 60-degree temperature rise.

◆

Recapitulation Sheet

American Artisan:

I am sending you a form prepared by a local "figure hound" for keeping costs on small jobs. The sponsor suggests that one form be filled in completely for every job to keep a record of material, labor, overhead. Line three is for any adjustment, plus or minus, to make the bid price an even figure. The lower section of the form provides an analysis of the figures above. The last column headed "% of Bid" is an analysis based upon Actual Bid Price.

What do you think of the form? Have you or any readers any comment to make?

W. M., Pennsylvania.

COST RECAPITULATION

Job No. _____

Name _____

Address _____

Kind of Job _____

			% of Bid
Material	$ 17:55		39.2
Labor	$ 4:10		9.3
Supervision	$:41		.9
TOTAL	$ 21:86		49.4
Sales Comm.	$ 5:-	11.4 %	xxxx
Collection	$ 2:50	5.7 %	xxxx
Interest	$:60	1.4 %	xxxx
Permit	$:	%	xxxx
Freight	$:75	1.7 %	xxxx
Incidental	$:	%	xxxx
Miscellaneous	$:	20.2 %	xxxx
TOTAL	$ 8:85		20.2
DIRECT COST	$ 30:71		69.6
Overhead Exp. 13%	$ 4:61		10.4
TOTAL COST	$ 35:32		80.0
1 Profit 20%	$ 8:83		20.0
2 Selling Price	$ 44:15		xxxx
3 + or -	$:15		✓
4 Actual Bid Price	$ 44:00		100%
5 NET PROFIT (1 and 3)	$ 8:68		xxxx

Analysis

Selling Price	$ 44:15	
Item #3 —	$:15	
Actual Bid Price		$ 44:—
Less Direct Cost	$ 30:71	
Less Overhead	$ 4:61	
TOTAL		$ 35:32
NET PROFIT		$ 8:68

Reply by The Editors

We have looked over your cost recapitulation sheet and so far as we can judge without knowing just what type of work the particular figures cover, we would say that the sheet is unusually complete and should give you a complete picture of just what is going on during the process of completing the work.

We note that you have a basis of over-head percentage of 13% on both material and labor, which in our opinion has always been an advantage in that it covers the type of job requiring a lot of material and little labor as well as the job with more labor than material.

The Problem Corner . . . . . .

We have had a number of interesting conversations with Fred Ritter and B. F. John of Philadelphia, both of whom seem to favor "Over-head based on productive labor only." We believe that these men are recommending overhead on productive labor for members of the Philadelphia Association. Of course you understand that we are not close enough to the work going on to know which method of figuring over-head is best suited to each particular contractor's operation. But we do feel that when all types of work are considered the contractor can go wrong when either material or labor far out-balance the other item.

We rather imagine that you file these sheets according to the type of job so that when similar work comes up, you have a close check on your cost. This seems to be a very satisfactory method of keeping track of all shop and field cost.

Whether or not your over-head percentage of 13% is high enough we cannot judge, but from contact with the field we rather imagine that this is rather a low over-head percentage. Perhaps you cannot secure any more over-head cost, due to the competitive conditions, but your net profit on the job seems to be quite satisfactory providing your salary is not included in the 13%.

We take it from the set-up that your salary is included in the difference between 13% over-head and 20% profit. We should be interested to know whether or not this is correct.

We don't quite understand what you use the column "Percent of Bid" for, and we should like to have you tell us just what you do with this column.

◆

First Floor Furnace

American Artisan:

I would like any information you can give on forced air heating systems in which the furnace and blower are set on the first floor?

W. E. K., Indiana.

Reply by
The Editors

We are sorry to say that we have not had a great deal of experience nor have we seen more than two installations in which the furnace was placed on the first floor.

Out in California, the Payne Furnace Company, 336 North Foothill Road, Beverly Hills, California, have done so many of these jobs with gas heat that they have developed a special furnace and a special system for installing these jobs. If you will write to the Payne company we think they will be glad to send you a copy of their bulletin describing this kind of system. We have only one copy which we hesitate to send away. According to this bulletin there is nothing especially difficult about the system.

The Payne people take in air from the outside rather than recirculate and introduce the warm air through floor registers served by ducts underneath the floor, or introduce the warm air from high side wall and base-board registers supplied through stacks which come down through partitions from branches and mains in the attic.

Seemingly the type of supply depends upon the peculiarity of the house and whether attic or ground runs are more economical. We presume, of course, that you are interested in forced air heating. It would be most unsatisfactory to try and heat this method by gravity. But so long as the fan positively withdraws air from the room or outside and positively pushes this air into the room, it makes little difference whether the furnace or fan are in the basement, on the first floor or even in the attic.

Pipe lay-out and pipe sizes would be identical whether the air runs on the level, up-hill or down-hill.

◆

Mechanical Heating

American Artisan:

I am referring to an article "Selecting Temperatures and Velocities" started in American Artisan, issue dated October, 1933, page 29. On page 37, the Editors' Note refers to the Mechanical Code, copy of which I do not have.

Also, I am trying to pick up and study forced air and air conditioning, but find I only know the gravity formulas so must learn estimating, heat losses, factors, etc., step by step. Any suggestions that may help me will be appreciated, keeping in mind a limited grammar school education and no finances for costly textbooks.

L. B. D., Oregon.

Reply by
The Editors

The Mechanical Code referred to in the October, 1933 issue of AMERICAN ARTISAN has been revised since that date. A copy is enclosed for your convenience.

You will note that the problems of heat loss calculation, factors for heat loss and exposure are practically identical with those of the Standard Code for Gravity Work. The sizing of pipes, selection of apparatus, determination of C. F. M., etc., are all covered in the Mechanical Code.

We might add, as a precaution, that the sizing of pipes by the ten per cent reduction method, as suggested in the Code, is satisfactory for small and medium size buildings, but is not recommended for the large structure having unusually long duct runs, a large number of branches and registers or any other condition which complicates the location of furnace and the required pipes.

In such cases, engineers suggest the sizing of pipes by the equal friction per running foot method.. This is covered in our book "Forced Air Heating."

◆

Constant Fan Operation

American Artisan:

I am interested in the record of successful forced air installations in residences using constant fan operation and controlling the heat input into the air stream by thermostat either by stopping and starting the burner or by-passing part of the return air thus varying the register air temperature.

What minimum and maximum register temperatures proved most satisfactory? What velocities were used at registers? What method of control of heat and humidity were used? Did the fan operate at constant speed or at two or more speeds?

Have you seen any system wherein control was accomplished by varying the amount of air flow by varying the position of the zone damper?

If you or any reader has had experience with systems of the above type I will very much appreciate comment.

D. D. Z., Missouri.

Reply by
The Editors

In reply to your request for information on successful warm air systems using continuous fan operation or some method of mixing outside and recirculated; unheated and returned air to change the register air temperature, we believe that the tear sheets attached from articles published during 1935, will give you a pretty fair idea of the extent of our material covering this subject.

Please note that some of the articles describing control systems do not deal with particular installations but the material has been gathered painstakingly from manufacturers, research data, and discussions with individuals handling zone operation as a daily job. In our opinion the articles on Zone Control are much more thorough than articles covering a special job.

We believe that you will be interested in the report of American Artisan split system tests in which several forms of continuous fan operations coupled with zone control and using both hand fired and oil burner operations are reported.

ASSOCIATION ACTIVITIES

Chicago

At the November 15th meeting of the Furnace and Sheet Metal Institute of Chicago officers and directors were elected as follows:

Officers—L. Drehobl, president; R. Guenther, vice president; C. Rice, recording secretary; P. Reif, financial secretary.

Directors—J. Subert; W. L. Abel; J. Novak; A. Lehmann; A. H. Gisiner; O. A. Reinhardt; M. Reif; F. Turk; E. Valkenaar.

The annual President's Night was held December 7th in honor of the officers who served during 1935.

◆

National Warm Air

The officers of the National Warm Air Heating and Air Conditioning Association state that without a doubt the organization's coming convention which is to be held in the Stevens Hotel, Chicago, Illinois, January 28-30, will be one of the most important and enthusiastic gatherings that the organization has held during its twenty-two years of activity.

One of the attractive features will be a joint session with the American Society of Heating and Ventilating Engineers on Wednesday afternoon, January 29th in the Stevens Hotel.

At this joint meeting the progress of the research work at the University of Illinois will be reported and an outline given of the Research of the American Society. The presidents of the two organizations will preside.

Tuesday—January 28th will be devoted to meetings of the association's standing committees, the board of directors and of industries.

The program for Wednesday and Thursday will include such valuable and timely subjects as:

Insulation, How and Why? (Prof. J. D. Hoffman, Purdue University).

Application of Gas to Warm Air Heating Systems (H. B. Johns, Chicago, Ill.).

The Bituminous Coal Industry's Program of Research in Domestic Heating (Ralph A. Sherman, Columbus, O.).

Real Merchandising a Necessity (L. R. Taylor, Utica, N. Y.).

The Combination Heating and Cooling Plant (Platte Overton, Chicago, Ill.).

Installation Codes Committee Report (Prof. J. D. Hoffman, Chairman).

Research Advisory Committee Report (F. G. Sedgwick, Chairman).

Recent Developments Relative to the Federal Housing Administration.

Members of the association will be invited to attend the special banquet of the A. S. H. V. E. held in the Palmer House, Wednesday evening, January 29.

Special railroad rates of one and one-third fare round trip, certificate plan, has been granted. The annual election of offices will be held during the convention.

◆

Philadelphia, Pa.

The meetings of the Roofing, Metal and Heating Engineers of Philadelphia since September, our first Fall meeting, have not been average in attendance, and the membership has lagged in payment of dues.

This condition is due to the after effects of the experience with the NRA Code, and the fact that the employers have been giving all their time to their increasing business during the last four months, after the long dry spell; in other words "they are busy" and have little time to spare for other things. There is reflection on association affairs due to the failure of the code, and because members feel the money spent on the code was wasted.

We believe that it will be necessary to rebuild the membership on more practical things and we have started to develop a number of things by separate group meetings on various phases of our business. The enclosed pamphlet will give some idea of how we are proceeding. Licenses for the trade: ordinances, collective advertising and many other things have been discussed, but the process will be slow until most of the employers have made some money.

Costs, estimating and bookkeeping are being discussed and we have installed some systems and held discussions with individual employers concerning their set-up and financial statements with good results.

F. U. Ritter,
Secretary.

◆

Syracuse, N. Y.

The general attendance at our association has fallen recently, but business has been exceptionally good which may account for the dwindling interest in association affairs.

A general furnace code has been written and adopted by the City of Syracuse and an inspector has been appointed to see that all installations conform with the code.

This has been accomplished through the efforts of this association, but we find that there are still too many loopholes which allow inexperienced men to do poor work and upset the standards of our business.

We are striving at the present time to work out a licensing system that may be applied to our business and hope to have some enforcement along these lines in Syracuse in the near future.

Howard W. Rother,
Secretary.

◆

Albany, N. Y.

Our local association has been able to hold some members due to the fact that the dues are only about $2.00 a year. Attendance has fallen off—usually the same men attending successive meetings.

The only activity we have had in this section is we have signed an agreement with the union for $1.00 an hour until May 1, 1937.

There has been little thought of local codes in this vicinity; in fact, there has not been much warm air heating or many air conditioned systems until this year.

James F. Keays,
Secretary.

◆

Wisconsin

Monthly meetings of the Sheet Metal Contractors' Association of Milwaukee and the Sheet Metal Contractors' Association of Wisconsin have been held regularly all during the fall and winter. At the November meeting of the Sheet Metal Contractors' Association of Wisconsin a discussion was held on the advisability of including air conditioning in the association name. It was suggested that the association be called the Master Sheet Metal, Heating, Ventilating and Air Conditioning Association and final decision will be made at the December meeting.

The Wisconsin State Association is preparing for the February, 1936, convention. Plans are under way to provide practical demonstrations and addresses of interest and importance. It is hoped that increased business will bring out better attendance than usual and that contractors from all parts of the state will be able to attend.

Indiana

The Sheet Metal, Warm Air Heating and Roofing Contractors' Association of Indiana, together with the Furmets (organization of salesmen serving Indiana contractors), are all working with increased enthusiasm to make the 1936 Indiana convention a bigger and better exhibition and a more worthwhile program. The dates of the convention are January 21, 22 and 23 in Indianapolis. The program has been in charge of a committee appointed last year, headed by O. O. Voorhees, who said when his committee began work that he intended the 1936 convention to be the biggest thing of its kind ever staged by the state. Paul Jordan, Secretary.

◆

Buffalo, N. Y.

Buffalo Sheet Metal, Warm Air Heating and Air Conditioning Association held the regular meeting at the Hotel Markeen, Friday, Dec. 6, 1935.

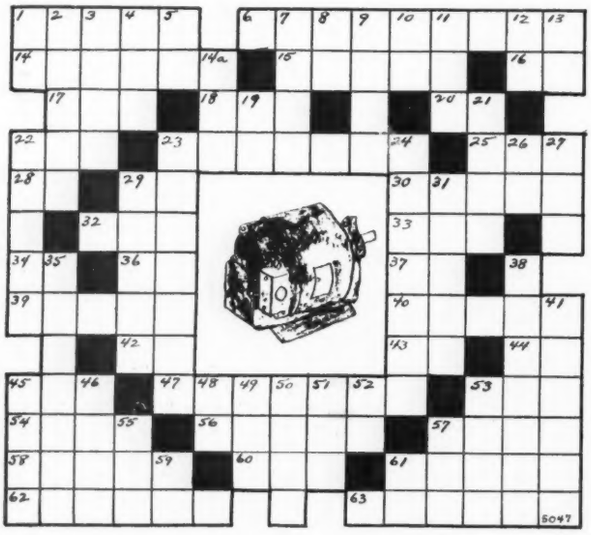
This meeting was attended by a large group of heating contractors. Members report business very satisfactory.

An air conditioning school is being sponsored by this Association and conducted by Charles Lighthart, Heating Engineer of the Furblo Co. This school is held every Tuesday evening at 8 o'clock and is open to all warm air heating contractors. On opening night there were 50 contractors present, also new members are joining at every meeting. This school is to help all warm air heating contractors, to promote better air-conditioning jobs and to learn how to do engineering instead of the manufacturer or jobber. This is the first time a school of this kind has been offered to the warm air heating contractors with a regular course every week.

Fred Frisch, Secretary.

American Artisan's Own Cross Word Puzzle

For the benefit of cross word puzzle fans we publish a puzzle based on our industry. The solution will be printed next month. A list of readers submitting correct answers will also appear. If you work the puzzle send us your solution.

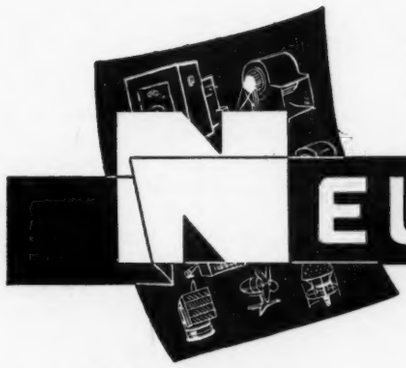


Across

1. What electric unit is shown in the center of this puzzle?
6. What company manufactures the Dexter Heat-Valve? (See advertisements).
14. To arouse from sleep.
15. Reed wood musical instruments.
16. The cost of an item (abbrev.).
17. Printers measures.
18. Over (poetic).
20. Edward's nickname.
22. A single unit.
23. What firm manufactures many types of electrical tools, one in particular being the Unishear? (See advertisements).
25. Part of the verb "to be."
28. We add this to our letter's when we remember something we should have put into the body of the letter.
29. Grand Union (abbrev.).
30. Being on the exterior side.
32. A rounded vase having a foot.
33. In what country do we live? (abbrev.).
34. Red Cross (abbrev.).
36. College degree.
37. Direction (abbrev.).
39. By oneself.
40. A gridiron.
42. Baby's first word.
43. Plural ending of words.
44. One (Scotch).
45. Printers measures.
47. Milwaukee furnace manufacturer advertising regularly in these pages and featuring the MMFP.
53. Railroads (abbrev.).
54. These lie outside the door so that one may remove snow, etc., from one's shoes before entering the house.
56. A contemptuous adjustment of one's lips and facial expression.
57. Very small garden vegetables.
58. Newspaper paragraphs.
60. Male parent.
61. Kitchen stove.
62. Persons afflicted with leprosy.
63. Mechanical unit used to clean air in air conditioning units.

Down

1. Female parent.
2. First name of glass company manufacturing Dustop, regularly advertised in this magazine.
3. To reclaim from a wild or savage state.
4. Slang word for "satisfactory" (two letters) (plural).
5. Legal; "with regard to."
7. Used, as a garment.
8. College degree.
9. America's most popular flower.
10. Tellurium (abbrev.).
11. Direction (nautical).
12. Skyward.
13. Initials of the Rough Rider President.
14a. In no manner or to no extent.
19. Each (abbrev.).
21. Itemized information.
22. Musical drama.
23. Trade name of furnace manufactured by the Fox Furnace Company of Elyria, Ohio, see advertisements.
24. Possessing more youth.
26. Legal; "with regard to."
27. Prior to.
29. First word in name of firm manufacturing Properaire, a modified air conditioner for any warm air furnace, see advertisements.
31. Those who employ something.
35. The weather.
38. Fan company of Kalamazoo, Michigan, advertising in these pages, "Air Handling and Conditioning Equipment."
41. To a smaller degree.
45. German name, male.
46. A pace with one's foot.
48. You and I.
49. The finish.
50. Water pipe is often made of this metal.
51. To be guided.
52. Comparative word ending.
53. To lease.
55. Southern Methodist Educational (abbrev.).
57. A very close friend.
59. The elder (abbrev.).
61. State of the union (abbrev.).



For your convenience a number has been assigned each item. Check the items in which you are interested on the coupon on page 61 and mail to us. Complete information will be forwarded.

● Indicates product not listed in 1935 Directory

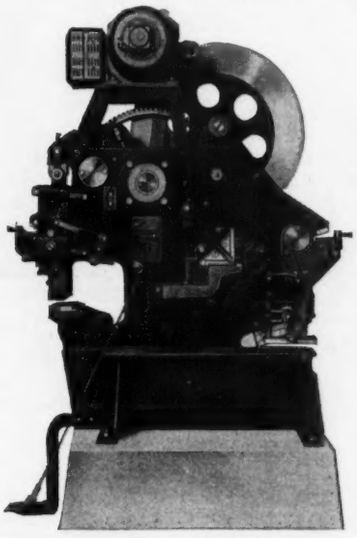
△ Indicates product and manufacturer not listed in 1935 Directory

NEW PRODUCTS

● 228—Iron Worker

The improved Buffalo Universal Iron Worker cuts rounds, squares, angles, tees, beams, or channels; punches holes in flats, plates or structural shapes or shears flats or slits plates. The frame is electrically welded "Armor Plate" steel, guaranteed against breakage forever.

Another feature is the built-in notcher and coper attachment which



can be had on all models. Both notching and coping operations are available without changing tools.

A triple punching attachment can also be furnished with this machine, having only one nut to be loosened to change dieblock.

Buffalo Universal Iron Workers can be arranged for either pulley or motor drive. The machines are manufactured by Buffalo Forge Co., Buffalo, N. Y.

◆

229—Air Meter

Julien P. Friez & Sons, Inc., Baltimore, Md., announce bulletin F which describes in detail and illustrates the Friez Air Meter. This new instrument is intended for the study and measurement of pressures or vacuums as well as velocities (in feet per minute) of air inside of ducts or at the face of grilles, fans, etc. The Friez Air Meter covers velocities as low as 140 FPM and up to 2,832 FPM, and pressure or vacuums as low as .00125" and up to .50" of water.

● 230—Psychometric Chart

The Air Conditioning Department of the General Electric Company announces a new and improved psychometric chart for solving the problems encountered in calculating the properties of air. It is the result of considerable research and experiment to develop a chart which would be more practical in form and which would simplify the reading of charted values.

The arrangement of lines on the chart is designed for greater accuracy and for an appreciable saving in time. As a result of this arrangement, values of all characteristics can be read, from any stated point on the chart, without the use of auxiliary curves.

Designed for permanent use at desk or drawing board, the chart measures 14 by 20½ inches; is printed in light brown and black on a basic foundation of a thin plate of laminated resinous substance similar to bakelite, with paper sheets, imprinted with the chart and explanatory data, sealed to both sides. The result is a permanent chart, with brown lines on a faint cream-colored background, which takes a drawing pencil like a good quality drawing paper. Pencil lines of any color may be either washed or erased easily from the chart.

The new chart is obtainable, at a nominal cost, through General Electric air conditioning dealers throughout the country.

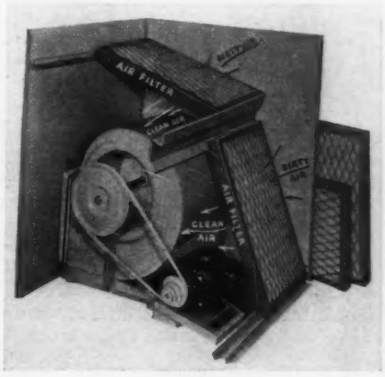
◆

231—New Welder

A new direct current welder is announced by Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa. The machine is equipped with a single dial preset control by which the welding current can be set to the exact number of amperes. Open circuit voltage, well below hazardous values, provides safety for the operator. The moment the arc is struck, the set adjusts itself immediately to the required pre-set value. A number of new and improved features are announced for the machine, such as automatic adjustment to the conditions of welding, one-piece common shaft, elimination of meters, exciter, rheostat, reactor, etc., and containing an entirely new principle of magnetic control which utilizes a magnetic shunt in the armature reaction flux path. The machine may be purchased either as a portable or permanent equipment.

232—Air Conditioner

Viking Air Conditioning Corporation, 1935 Euclid Avenue, Cleveland, Ohio, announce the new Vik-Air conditioner, which consists of a three-speed blower and large filter area. The three-speed drive consists of a self-adjusting motor base with mechanical connections which are manually



changed according to the rating desired. The company recommends low operation for mild weather, middle operation for winter weather and high speed operation for summer cooling. Filters are so arranged that air may be cleaned when drawn either from the return air system or from the basement. The housing is of panel construction, fully insulated, and is shipped knocked down.

◆

● 233—Combustion Chamber

Lewis Air Conditioners, Inc., Minneapolis announce a new combustion chamber made by the Vermiculite Refractories Company, a subsidiary of Lewis Air Conditioners, Inc. The material used in vermiculite refractories is high in heat resistance and insulation value and weighs about one-half that of fire brick.

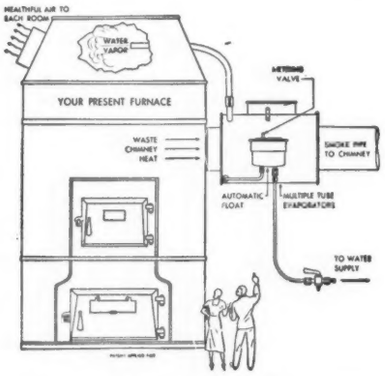
The entire installation requires less than one hour. The chamber comes complete in one package with sufficient loose vermiculite fill and vermiculite refractory cement to completely install one job.

While standard units come in 1, 1½, 2, and 3 gallon sizes, other chambers can be built to specifications. The vermiculite product is also adaptable to industrial processing where high heats are required.

New Products . . . . . .

234—Humidifier

A new automatic humidifier, designed to be placed as a part of the smoke pipe, called the "Heathaire," is announced by Rochester Manufacturing Company, Inc., Rochester, New York. The evaporator unit is an all copper tube oxwelded in one piece and completely sealed from the flue gases. An automatic float maintains a constant water level in the evaporator tubes and is designed so that vapor and steam



only pass into the furnace bonnet. The housing which surrounds the evaporator is oversized to compensate for any tendency of the evaporator tubes to impede the normal chimney gas movement. The unit comes for all sizes of smoke pipe. Steam and water vapor, vaporized by the flue gas temperatures, are injected into the bonnet of the furnace through a special copper tube. The float valve is connected in turn to the water line and an automatic valve. The housing can be arranged in several ways so that entrance from the furnace or the connection of the smoke pipe can be made from either end or the top.

◆

235—Wintermaster

A new heat exchanger, boiler and blower unit for split system operation is announced by the International Boiler Works Company, Inc., East Stroudsburg, Pennsylvania. The boiler will be made in two sizes ranging from 163,000 to 244,000 Btu. output with an exchanger having a capacity ranging from 142,000 to 214,000 Btu. The c.f.m. fan delivery against ½ inch static pressure is 1100 and 1600 c.f.m. The boiler consists of a cylindrical base wherein an oil burner is mounted and a horizontal steel tubular boiler mounted on the insulated and refractory lined base. The boiler furnishes steam for the heat exchanger; also for direct radiation, and is the source of domestic hot water supply. The heat exchanger is a vertical copper tube and fin type. A double inlet centrifugal type blower and motor are mounted directly behind the exchanger and on top of the boiler. Filters are included as well as a spray type humidifier controlled by a solenoid valve.

236—Welder

An A. C. electric arc welder which welds light weight metals, down to 26 gage steels, with amperage from 15 to 275, is announced by the Miller Electric Mfg. Co., Inc., Appleton, Wisconsin.

Known to the trade as "Miller's Wonder Arc Welders," they are adaptable for plants handling light weight steels, or anywhere a portable electric welder is required.

The welder is complete with welding leads and hand shield and is equipped with handles for portable use. Made in three sizes—15 to 150 amperes, which handles $\frac{1}{16}$" to $\frac{5}{32}$" rod; 15 to 275 amperes which handles $\frac{1}{16}$" to ¼" rod, and the junior welder, 15 to 90 amperes for small power service. They operate on 220 volts, 60 cycle single phase.

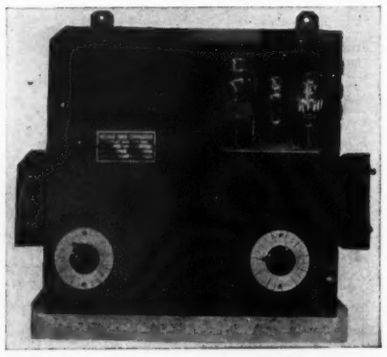
◆

● 237—Timer

The Welding Timer Corporation, 251 Ogden Street, Newark, N. J., announces a line of electro-mechanical timers for spot welding machines.

The device consists of an electronic timing element and a set of balanced contactors specially designed to handle the high overloads encountered in spot welding.

Welco Timers permit spot welding at times as low as one cycle. Timing accuracy of less than ¼ cycle, plus or minus, is guaranteed at one cycle operation. At slower speeds, for exam-



ple, between 20 and 30 cycles, any reasonable accuracy can be assured, even up to 2 per cent plus or minus. Timers for longer times may be had on special order.

Standard settings cover a range of from one cycle minimum to 30 cycles maximum. Dial settings permit infinite variation of times between maximum and minimum.

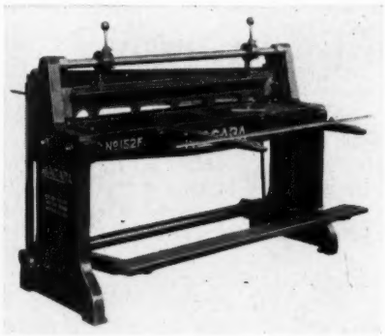
Welco Timers are made in standard sizes for 30, 50, 150, 250 and 600 amperes. This range covers practically all spot welding requirements, but larger sizes can be had on special order. Literature available on request.

238—Foot Shear

The Niagara Machine & Tool Works announces a complete new line of Series F, foot operated squaring shears for cutting 16-gage metal.

New type, one piece, closed panel, high tensile cast iron housings and a bed of channel section are used.

A new feature for foot operated shears is the steel holddown. The holddown is operated manually by self-locking eccentrics, exerts heavy



pressure on the sheet and provides visibility of the cutting edge. Another new idea in foot operated shears is the steel crosshead. It provides a rigid backing for the knife, at the same time holding weight to a minimum.

Series F Shears are completely equipped with Niagara Shear Knives, back gage, front gage, side gages and bevel gage. They are available in cutting lengths from 36" to 72" for 16 gage. Foot operated shears in 8 foot and 10 foot cutting lengths are also available for 18 gage.

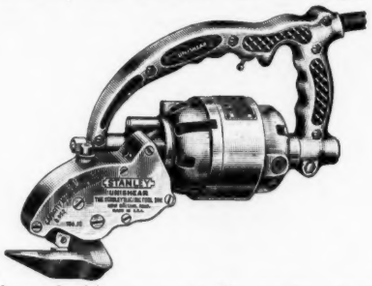
◆

239—New Unishear

A new portable, electric shear known as Stanley Unishear No. 16 has been brought out by The Stanley Electric Tool Division, New Britain, Conn.

This new Unishear with almost twice as much power and of heavier construction, is designed primarily for shops doing production work on tough sheet materials or for job shops that cut up to 16 gauge hot rolled steel.

Some of the features listed by the manufacturer are: Speed as you feed up to 15 feet per minute; cuts straight lines, curves, angles and notches with accuracy and without burr or distor-



tion; inside cuts easily made after punching a 2-inch hole for the yoke; cuts circles or curves with a radius as small as 1½ inches; easy and comfortable to work with; it weighs only 10¼ lbs., is 13½ inches long, and has a pivoted duplex handle.

News Items . . . . . .

Heating and Ventilating Exposition

The ascendency of air conditioning as a new American industry will be brought to a new high mark of public appreciation by the Fourth International Heating & Ventilating Exposition, to be held January 27-31, 1936, at the International Amphitheatre in Chicago, Illinois. The proper conditioning of the air in winter as well as summer will be set forth in its true importance in terms of hundreds of dynamic displays showing the proper heating and humidifying of the air of houses, factories, and office buildings.

Instruments of precision always constitute a very interesting section of the Heating & Ventilating Exposition. On display this year will be humidistats, thermostats, effective temperature controllers, recording instruments for humidity and temperature, sling and aspirating psychrometers, indicators for humidity and temperature, anemometers and air meters. There will also be a complete range of automatic controlling, indicating, and recording instruments for air conditioning in every field.

Among the variety of special products which the Exposition will present will be refractory products, stove and furnace linings, new jointless firebrick, acoustic duct linings, automobile and airplane acoustical materials, multi-speed motors especially suited for fan room installations as a means of varying the quantity of air to meet changing weather conditions.

Heat transfer surfaces will be a feature with several exhibitors who will demonstrate them in relation to problems of heating, cooling, and air conditioning. There will be convection heaters, commercial heat transfer units, blast units, unit coolers, and evaporators. One heat transfer surface will utilize large elliptical copper tubes to secure maximum possible heating surface in contact with passing air. This design is said to eliminate eddies and dead air pockets.

The conduct of the Exposition and all details of exhibit arrangements and leasing, are in charge of the International Exposition Company of Grand Central Palace, New York, and Mr. Charles F. Roth is again personally in charge.

◆

Burdick, Memphis, Reports Good Business

A. W. Burdick and Co. at 554 Adams Ave. just beyond the Southern R. R. tracks that traverse up town Memphis is one of Memphis' oldest firms in the roofing trade. The company moved to this location after a decade of operation on South Second, Hernando and central up town. Slate, metal and other forms of roofing have received the company's attention and considerable warehouse stock is carried.

◆

Homes Lead in Modernizing Program

The bulk of the work being done under the Modernization Credit Plan of the Federal Housing Administration is concentrated on single family residential property. A breakdown of loans reported during August and September to the Housing Administration from financial institutions making modernization loans indicates that 57.1 per cent of the total amount of money involved is being spent on this type of property.

Next in line is other residential property, including apartment houses, hotels and similar structures. The amount spent of these is 25.7 per cent of the total. The amount being borrowed for the improvement of retail stores is 7.8 per cent; that going for the improvement of commercial property, 3.4 per cent; for industrial property, 2.5 per cent; and for institutional property, 0.7 per cent. The remainder of the money, 2.8 per cent, is going for the modernization and repair of miscellaneous property not falling within the above classifications.

ANNOUNCING A NEW LINE OF

NIAGARA

SQUARING SHEARS

—Foot Operated, Series F—

Capacities: 16 gauge up to and including 72 inch cutting lengths.
18 gauge on 96 and 120 inch cutting lengths.

New Self-Locking Eccentric Holddown
New Steel Crosshead
Smooth, Easy Operation with Improved Cutting Action
Convenient, Accessible Arrangements for Operator
Straight, Accurate for Cutting 36" to 120" Cutting Lengths

Mail Coupon for Bulletin Covering Niagara Machines and Tools

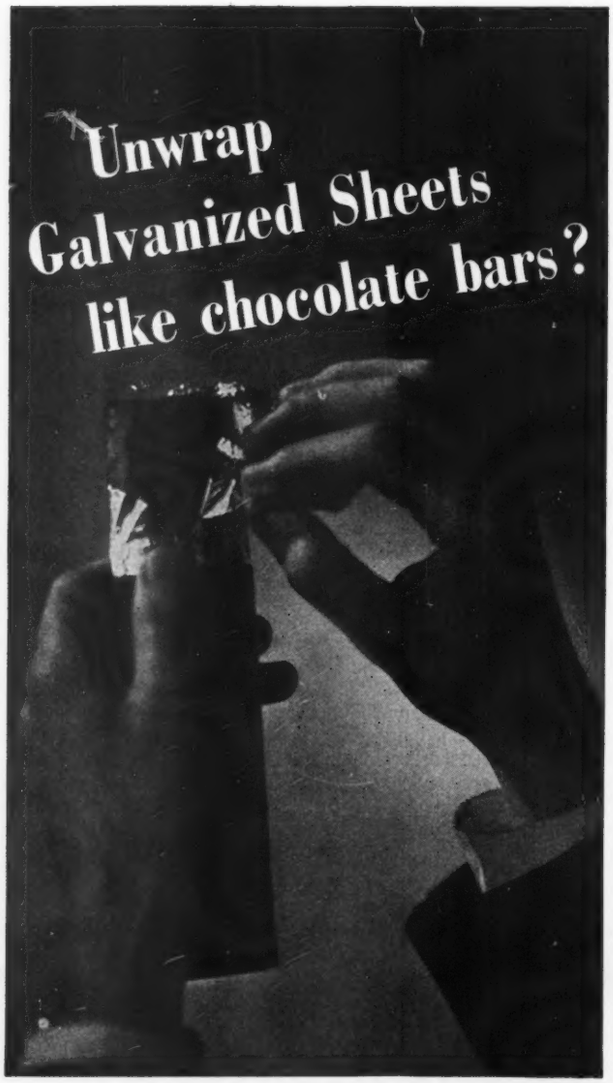
NIAGARA MACHINE & TOOL WORKS
637-697 NORTHLAND AVE., BUFFALO, N. Y.

Please send complete description of Series F Shears and items checked below:

☐ Foot Gap Shears
☐ Groovers
☐ Slip Roll Formers
☐ Power Squaring Shears
☐ Shears: Squaring, Rotary
☐ Lever Shears & Punches
☐ Machines for Turning, Wiring, Beading, Burring, Flanging

Name .....

Street..... City.....(AA12)



Of course not– *but we wish you could*

To judge the quality of a chocolate bar you must remove the foil wrapper, no matter how attractive it may be. So it is with galvanized sheets. Galvanizing doesn't tell the whole tale. The metal inside counts as much.

You can't unwrap a galvanized sheet, but you can be just as sure of inside quality by working with Galvanized Armco Ingot Iron. These sheets are generously and uniformly zinc-coated; yet beneath the bright-spangled surface is a highly-refined, durable iron base —a metal that has proved its exceptional durability in twenty-nine years of diversified service.

Get in touch with the Armco Distributor to learn *all* the advantages of using this durable iron. He has ample stocks and is ready to serve you promptly. And be sure to ask him about the many valuable, business-creating services he offers. The American Rolling Mill Company, Executive Offices, Middletown, Ohio.

ARMCO

ARMCO
INGOT IRON

News Items . . . . . .

Purdue University Housing Research

Contracts have been let for the construction of three houses, each costing less than $5,000, to be erected in the first unit of the Purdue University Housing Research Project, according to Frank Watson, director. Construction will be started immediately in an effort to enclose the houses before cold weather. One house designed by Burnham Bros. and Hammond of Chicago, will be constructed of reinforced concrete at a cost of $4,997. A second house, designed by J. Andre Fouilhoux, of New York, which is cellarless, is of wood frame and stucco construction, to be erected at a cost of $4,681. The third home, also without a basement and designed by Howard T. Fisher, of Chicago, is of prefabricated plywood units which will be built by General Houses, Inc., Chicago, at a cost of $4,236. The construction costs are complete including plumbing, electric and heating work.

The houses in this first group are designed to provide accommodations for families consisting of two adults and two children of opposite sexes. For economy in space the living and dining rooms are combined as one room. In addition, the houses include kitchen, three bedrooms, bath and garage.

There will be a total of nine houses in the first Housing Project Unit. The six remaining houses are now in the process of being designed in preparation for the taking of construction bids.

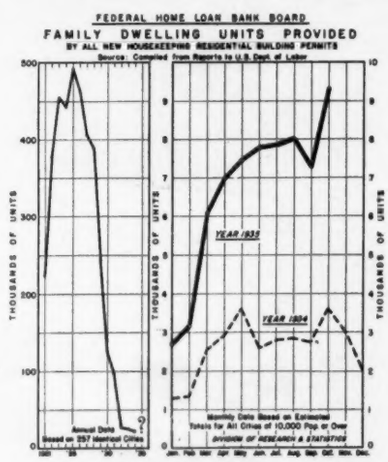
When erected these houses will be lived in by Purdue University faculty members and will provide a practical research laboratory for the purpose of finding a solution to the problem of building satisfactory homes within the cost range of the majority of home owners in the United States. For the purpose of research, all houses in the group are utilizing a variety of construction methods, combinations of building materials, and household equipment. Records will be kept of all detail labor and material costs on these houses as a basis for further study in finding a means of reducing the building costs.

◆

1935 Residence Construction

More than twice as many family dwelling units were built during the first 10 months of 1935 as in the entire year of 1934, according to estimates of building permit records from all cities of 10,000 population or upward.

The 9,313 units constructed in October exceeded the October, 1934, record by 158 per cent. From January 1 to



October 31, dwelling units provided numbered 66,261, which is 150 per cent more than during the same period of last year and 112 per cent more than in the 12 months of 1934. The September to October gain of this year was 28%.

The estimates are based upon building permit records from 775 cities, available through the U. S. Department of Labor.

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 61.

332—Pipe and Fittings Guide Chart

Lamneck Products, Inc., 416 Dublin Avenue, Columbus, Ohio, announce the Lamneck simplified guide chart for standard stock sizes in forced air fittings and duct work. The chart is designed to assist the estimator in selecting the sizes and types of pre-fabricated fittings and ducts required for forced air installations. The chart opens out into six pages, on which are shown all of the types of fittings and sections manufactured. Each section is listed according to size and price so that the proper fitting may be selected by referring to the drawing and checking in the table below for size. To assist contractors who have not purchased pre-fabricated fittings a sample installation is shown in blueprint form together with a table of sizes and items required for the duct system.

◆

333—Sheet Metal Machine Leaflet

Bulletin No. 35 is announced by Ward Machinery Company, 564 West Washington Boulevard, Chicago, Illinois. The leaflet shows and describes the Ward metal forming machines which turn edges on sheet metal to 5/8 of an inch up to 16 gauge material. The leaflet also shows machines for beading, crimping, combination bench machines, shears (both power and bench), folders, forming machines, brakes and metal cutting saws manufactured and distributed by the Ward Company. Tables giving all sizes, capacities and prices accompany each machine.

◆

334—Shear Catalog

Catalog "S," presenting photographs, descriptions and tables of characteristics, capacities and sizes for Cincinnati all-steel shears, is announced by the Cincinnati Shaper Company, Cincinnati, Ohio. Photographs of the various shears in the company's line, together with photographs and descriptive matter of the features of the machines, are presented throughout the booklet.

◆

335—Soldering Stainless Steel Leaflet

The Joseph T. Ryerson & Son, Inc., Chicago, have a revised instruction leaflet covering the soldering of Allegheny metal. The leaflet explains the various grades of solder which can be used and the conditions which govern the selection of the proper types of solder. The characteristics of stainless steel, which make soldering difficult unless a full understanding is had, are presented. Information is given on the selection of a proper flux, the method of handling flux, the proper method of soldering and polishing methods after soldering.

◆

336—Control Catalog

The Fulton-Sylphon Company, Knoxville, Tennessee, announce temporary bulletin No. 810 covering space temperature control. The company manufactures a line of control apparatus for mechanical warm air heating systems, zone warm air heating systems including high limit controls, fan controls, damper motors, humidistats and other required apparatus. The catalog gives full descriptions of the control apparatus with its operating characteristics and shows apparatus wiring diagrams and arrangements.

◆

337—Air Conditioning Unit Leaflet

Lennox Furnace Company, Inc., Marshalltown, Iowa, announce Bulletin H-20 describing the Aire-Flo air conditioning units. Each unit consists of the Lennox steel furnace with the Aire-Flo blower-filter unit, either with or without washer operation. Cut-away views show the apparatus with complete discussion of its features and mechanical parts. Table of specifications and ratings together with dimensions of the units is presented.

Introducing

THE NEW CAST OR STEEL RYBOLT LINE

The new 1936 Rybolts are ready . . . the result of years of experience, research and development . . . an improved all-cast iron Rybolt and a brand new steel Rybolt. We offer them to the trade with confidence that they will meet every comparative test of beauty, efficiency, capacity, quality, strength and price.

The Rybolt Cast Iron

Differs considerably in design from previous models but retains the time-tested Rybolt features such as duplex ball-bearing grate and one-piece radiator. Important new feature is the Rybolt slip-on front casting construction, eliminating joints between door frames and body of furnace. Greater heating capacity. Special analysis iron.

The Rybolt Steel

A worthy companion to the famous cast iron Rybolt, fully comparable in its class. All the advantages associated with steel warm air furnaces are found at their best in the new, scientifically designed steel Rybolt. Constructed in such a way that the heating element is practically a one-piece unit . . . good for years of heating service.

Write at once for complete information on these new Rybolts. They meet 1936 demands with modern 1936 features.

THE RYBOLT HEATER COMPANY

Eighth St. Ashland, Ohio

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 61.

338—Heat Loss Chart

Century Engineering Corporation, Cedar Rapids, Iowa, announce a new chart which is to be used to determine the B.t.u. as well as radiation or c.f.m. necessary for any particular type of building in various sections of the country. On a map of the United States, showing the various states, is transposed an Iso-B.t.u. heat loss map, used as follows: the map contour figures are multiplied by the square feet of glass area, exposed wall area and floor area, to determine the total heat loss in B.t.u.'s per hour. These factors are based on average frame construction, without wall or ceiling insulation, storm windows or weather stripping. For brick construction a deduction is made, also for insulated walls, insulated ceilings, etc. By knowing the total heating load and dividing the B.t.u. loss by 60, or by multiplying the actual standing steam radiation by 4, or multiplying the actual standing hot water radiation by 2½, the contractor is able to estimate the approximate oil consumption per heating season. The company announces that they will be very glad to mail charts to interested readers.

◆

339—Recording Instrument Leaflet

A new leaflet, containing full information on thermometers, temperature recorders, humidity recorders manufactured by Practical Instrument Company, 2717 North Ashland Avenue, Chicago, has been prepared by the manufacturer for distribution to the trade. The various types of recording instrument manufactured, together with complete descriptions of their construction and operation, are presented in the leaflet. Tables showing ranges of operation and prices are also furnished.

340—New Price List

Excelsior Steel Furnace Company, Chicago, has issued a new catalog containing revised lists on furnace pipe, furnace bonnets and everwear elbows effective October 1st to which one discount will apply. A wide distribution of this catalog has been made but if any dealer has been overlooked a copy will be mailed on request to the company at 118 So. Clinton St., Chicago.

A new pamphlet covering revised lists of galvanized ducts and fittings for forced-air heating and air-conditioning installations will be issued in the near future.

◆

341—Welding Timer Leaflet

Welding Timer Corporation, Chrysler Building, New York City, announce a new leaflet showing and describing the company's line of welding timers. The purpose of the timer is to control the length of time of welds, whether the time required be a fraction of a second or a period of one second or more. By using the timer a uniform weld in even the smallest type of items welded can be secured. The timer consists of two single pole contactors in series with each other and the primary of the welder and the timing circuit. The leaflet shows the various sizes of apparatus manufactured and explains operation.

◆

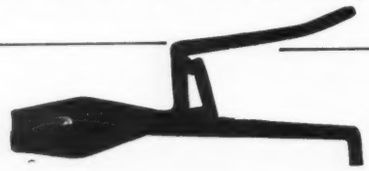
342—Metal Building Catalog

Edwards Mfg. Co., Cincinnati, Ohio announces a new catalog (88) which shows sheet metal building material manufactured in various sizes, weights, etc., and also gives a considerable amount of information on subjects with which laymen and some builders are not familiar, such as pitches, amount of nails per square, type of nails for certain types of roofing, common sense golden rule for roofers, recommended types of metal, roofing for various types of construction, methods of applying, galvanizing and manufacturing metal roofing.

SHEET METAL BUILDINGS PRESENT A BIG MARKET FOR YOU!

» » » THERE is a definite trend toward the construction of Sheet Metal Buildings in all parts of the country. No sheet metal man should overlook the profit possibilities this construction work offers him in his own community. The man most likely to get this business is the man who has the best, most efficient equipment . . . and no kit is complete without a Viking Shear. The Viking will aid you to effect economies in construction for it cuts quickly and accurately, every time.

VIKING SHEAR COMPANY, ERIE, PA.



THE VIKING SHEAR

WARM AIR FURNACES
FURNACE FITTINGS
FURNACE PIPE
REGISTERS
FILTERS
FANS
BLOWERS
CONTROLS

A DEPENDABLE SOURCE OF SUPPLY

THE J. M. & L. A. OSBORN Co
Manufacturers—Distributors
DETROIT-CLEVELAND-BUFFALO

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 61.

343—Exhaustor and Circulator Leaflets

The Forct-Air Company, Rockford, Illinois, announce three new mimeographed sheets covering the company's exhaustors and air circulators. The forced air exhaustor is a propeller type fan either cased for application to ducts or housed for exhaust work through walls, window openings, etc. Full explanation of the operation of the unit for all types of work, together with tables of sizes, ratings and characteristics are presented. The fans are rated from 1200 to 14000 c.f.m.

◆

344—Furnace Catalog

The Sam Daniels Manufacturing Company, Inc., Hardwick, Vermont, announces a new catalog of sheet metal products, including chunk furnaces, coal furnaces, school room heaters, light fishing boats and rocking milk chests. Each item is shown in illustration, accompanied by tables of dimensions and operating data.

◆

345—Steel Sheet Catalog

The Superior Sheet Steel Company, Canton, Ohio, announce a new catalog describing the company's line of galvannealed steel sheets. The catalog describes the galvannealed patented process, what it is and how it is obtained, also its fabricating characteristics. Many pages show typical products manufactured with galvannealed sheets, ranging from household units to such public items as lamp posts and signs. The leaflet also describes the company's Super-Metal, which is a copper bearing steel sheet, coated with prime spelter. Many products manufactured with these sheets are also shown in illustration and explained in text.

◆

346—Insulation Folder

The Insulite Company, Minneapolis, Minn., has just issued a new folder, "Living Comfort in Spite of Hot Weather." It pictures the use of Insulite in reclaiming waste attic space by converting it into livable rooms, and for use in summer cottages.

◆

347—Exhaust and Ventilating Fans

The Aerovent Fan Company, Piqua, Ohio, announce a new leaflet and catalog describing the company's "Macheta" airfoil exhaust and ventilating fans. The leaflet shows and describes the fan while the catalog contains a full explanation of the aerodynamic characteristics of the units, charts of performance for various sizes and types of fans, accompanied by full tables of ratings for all of the types and sizes manufactured.

FOR YOUR CONVENIENCE

American Artisan, 6 N. Michigan Ave., Chicago, Ill.

Please ask the manufacturer to send me more information about the equipment mentioned under the following reference numbers in "New Products" and "New Literature." (Check numbers in which you are interested):

228	229	230	231	232	233
234	235	236	237	238	239
332	333	334	335	336	337
338	339	340	341	342	343
344	345	346	347		

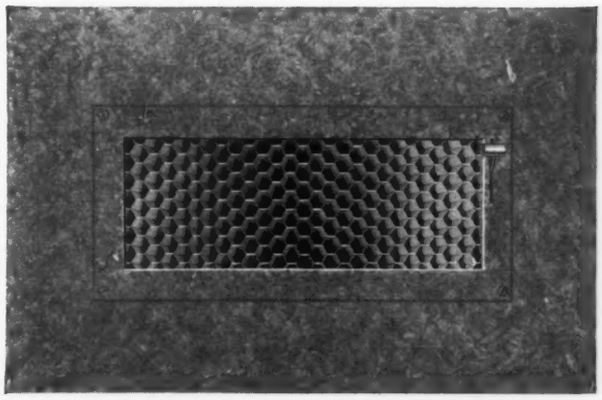
Name ..... Title.....

Company ....

Address .....

SUCCESSFUL AIR CONDITIONING

Demands Scientifically Designed Grilles and Registers



The New H & C No. 90 Grille

In Air Conditioning select the grilles and registers required with careful discrimination; for on their design and construction depends in a large measure the success of the entire job.

Into the design and construction of the new H & C No. 90 Grilles and Registers has gone a vast amount of scientific research and engineering. And as a consequence, most satisfactory air distribution can be achieved with this equipment under all conditions. Cold spots and stratification can be avoided and greater uniformity of room temperatures accomplished than has hitherto been possible.

Accurate selection of grilles and registers required is made simple by data and charts contained in our new Air Conditioning Catalog, No. 35 A. C., copy of which will be sent on request.

Write Today:

Provides

COMPLETE DIRECTIONAL CONTROL OF AIR FLOW

The No. 90 Grille is made to direct the air exactly as desired, to the right, left, straight ahead, or in any combination required.

IDEAL DISTRIBUTION OF AIR

The Air Flow in the tubes of the H & C No. 90 Grille is guided in a smooth path and not deflected at an abrupt angle. This unique feature eliminates all turbulence, results in a minimum of resistance, and insures accurate control of the air distribution.

ATTRACTIVE APPEARANCE

Shape and depth of grille openings effectively conceal duct. Valve operating handle located in margin leaves grille unobstructed. Used with the 3 piece frame, installation may be made flush with the wall.

HART & COOLEY MANUFACTURING CO.

Warm Air Registers · Regulator Sets · H&C · Air Conditioning Grilles · Dampers · Chain

61 W. KINZIE ST. · CHICAGO · ILLINOIS

With the Manufacturers . .

Liberty Foundry Buys Symonds

The Liberty Foundry Company has purchased the assets, including goodwill, of the Symonds Register Company from the estate of the late Herbert Symonds.

Symonds registers, on the market for thirty-five years, will continue to be manufactured and sold with no change in the policies established by Mr. Symonds.

The complete standard "Symonds" line included baseboard and wafer registers, and cold air faces.

Being exclusive distributors, a complete line of "Auer" registers and cold air faces; "Independent" original fabricated floor registers, cold air faces, and forced air registers will be carried in stock and distributed to jobbers and dealers.

◆

Appoint Canadian Representatives

The American Nickeloid Co., Peru, Ill., manufacturers of nickel, chromium, brass and copper coated sheets, have appointed George L. Starr, 330 Bay St., Toronto 2, Ontario, Canada, and Gordon L. Elmslie, 660 St. Catherine, W., Montreal, Quebec, Canada, as their Canadian representatives.

Both representatives have had a considerable amount of experience in allied lines. Appointments were effective November 1. With these appointments a total of twenty offices and agencies are now in the field.

◆

Cheney Announces Distribution Plan

In order to make Cheney flashing more readily available to the building trade in all sections of the country and to put this product on a commodity basis, rather than on a made-to-order one, the Cheney Company announces that in the future, Revere Copper and Brass, Incorporated, will handle all sales work for the Cheney Company. Cheney flashing will be carried in stock by Revere sheet metal distributors throughout the United States.

The Cheney Company will continue to manufacture the flashing, and Cheney engineers will continue to be available as heretofore for consultation on problems arising in connection with the use and installation of Thru-Wall Flashing.

◆

Schmieder Resumes Post at Milcor

Announcement has been made that Robert S. Schmieder will again be manager of the Metal Specialties Division of the Milcor Steel Company, Milwaukee manufacturers of sheet metal products and fireproof building materials.

Four years ago Mr. Schmieder resigned his Milcor position to become secretary of the Super Steel Products Company. In that position until the present time he has continued his activities in the steel building material industry.

His sheet metal contracting activities give Mr. Schmieder a thorough understanding of the dealers' and contractors' problems of fabricating, merchandising, and selling in the wholesale, retail, and contracting fields.

◆

Keith Evans Promoted by Inland

Keith J. Evans has been appointed Manager of the Sales Promotion Division of Inland Steel Company, according to an announcement made today. Mr. Evans will be in charge of the company's advertising, sales statistics and commercial research. He has served in a similar capacity with Joseph T. Ryerson & Son, Inc., since 1917, and will continue to do so in addition to his new position with Inland Steel Company. He will have offices at both establishments.

6 *Reasons Why it's Easier to Sell a*

MELLOW WARM AIR FURNACE

- One-piece Base and Floor Ring Facilitates Installation.
- Leak-Proof Radiator Cast with Smoke Collar and Cleanout in One Piece.
- Corrugated Combustion Chamber Gives Greater Radiation and Longer Life.
- Two-Section Fire Pot with Deep Cup Joint for Proper Expansion.
- Mellow Duplex Ball Bearing Grates Save Fuel.
- Slip-over Front. Machined Fitted Doors. Gas Tight, Smoke Proof.

These are only a few of the features found in Mellow Furnaces—Write for complete detail today and push these easy sellers.

LIBERTY FOUNDRY CO., ST. LOUIS, MO.

Also Manufacturers of

FRONT RANK FURNACES

UNIVERSAL BENDER. Simple to operate. Nothing to get out of order.

Capacity, ½" x 2". Bends cold. Smallest square 3" x 3" cube.

WHITNEY METAL TOOLS

Use Whitney tools in your shop. We manufacture a full line. Only a few of the many items can be shown in this advertisement.

RIVET SETS. Whitney rivet sets are drop-forged from the highest grade steel and designed to fill every requirement. Sold in 10 different sizes.

IMPERIAL ROLLER BEARING PUNCHES. Offered in 3 sizes. Will work inside 90 degrees. Quick changing for punches and dies. No cams to wear. Stripping positive.

RIVET PUNCHES & DIES. We can supply a complete assortment of rivet punches and dies from stock.

Good tools are essential to a profitable business. Make it a habit to use Whitney tools and to consult us on any tool problem.

WHITNEY METAL TOOL CO.

91 FORBES STREET

ROCKFORD, ILLINOIS

Baffling Practice

(*Continued from page* 14)

the baffle for circulation since we feel that there is enough air leakage around the joints to take care of this.

We realize that this could possibly be improved by constructing a baffle similar to the dotted line "x," as shown on the sketch, since this would bring the air closer to the firepot and mouthpiece, but we have not attempted to use it because of its awkward construction and high cost.

Number 12

W. H. Smith, Sales Counsel, American Furnace & Foundry Co., Milan, Mich.

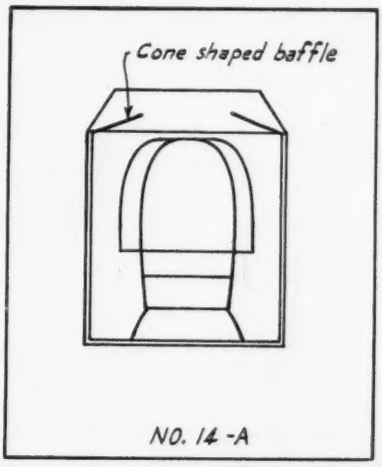
Figs. 12 and 12A show our recommendations for baffling cast iron, round cased furnaces when converting to forced air. The shaded areas show the type of boxed sections we have developed. These sections are exactly the same except for the two sections at the front. The box sections (with sides marked A, B, C) are formed from a single piece of metal and have bolting ears attached for connecting the box sections together. The lower face of the baffle is about 15 inches above the floor, while the top is about 3½ inches below the lower edge of the radiator.

The space between the face of the baffle and the casting is about 3½ inches on the average. Above the box sections we use a single, circular sheet as shown running from one door frame edge to the other edge. This sheet extends to the top ring of the casing. It is our contention that this construction provides a large pressure chamber at the bottom of the casing, which aids in distributing the incoming air evenly throughout the interior. The top baffle sheet provides an air way about equal to the space between radiator and drum and accelerates the air flow into the top of the casing.

Number 13

F. N. Parker, Advertising Manager, The Round Oak Co., Dowagiac, Mich.

From the experiments we have conducted on baffling cast iron furnaces we recommend an interior, box-shaped baffle which extends from the floor to the top ring of the casing. This baffle is closed at both top and bottom and is built of black iron. At its closest point the baffle is 2 inches away from the radiator. The baffle is constructed either as one piece or in several pieces and usually has nine faces as shown in Figs. 13 and 13A. The baffle stops short of the fire door frame as shown, but can be carried to the frame if desired.

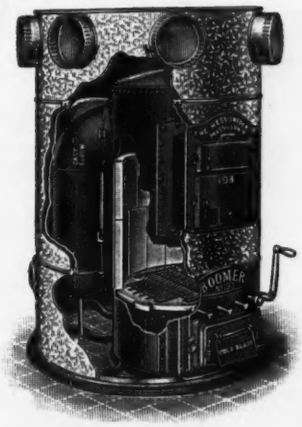


Number 14

John J. Fischer, President, Excelsior Stove & Mfg. Co., Quincy, Ill.

For furnaces similar to the open dome type we manufacture we recommend a cone shaped baffle placed above the top of the combustion chamber and having a central opening equal in diameter to the main body of the furnace. For a furnace having a combustion chamber with a 26-inch diameter the hole would be 26 inches. Where the combustion chamber has fins the hole is made the diameter of the chamber proper and not the diameter of the outside of the fins.

This type of cone baffle, we feel, maintains an equal distribution of air at all outlets to leaders and also maintains an equal temperature throughout the bonnet.



Boomer Boiler Plate Furnaces

Also made with duplex grates and upright shaker.

Have been successfully made for 23 years. Where introduced have given satisfactory service. The fire pot liners are the best we can buy and we know of several Boomers that still have the original liners in, which are 23 years old. We have been making cast iron Boomers for 50 years.

If you are interested in selling a strictly high grade furnace, ask for prices and agency.

Nothing but the best of material enters into the making of Boomers.

When repairs are needed, avoid risk of dissatisfaction by ordering direct from the original patterns. Prices are low.

We sell to legitimate dealers only.

THE HESS-SNYDER CO., MFRS.
Massillon, Ohio

BETTER INSTALLATIONS
BETTER REPAIRS!
with **Nu-DRY**
FURNACE CEMENT

Nu-Dry has every feature you have been seeking in a furnace cement . . . it will insure good jobs, and good jobs mean better profits.

Look over these outstanding points:

- It comes to you in dry form
- Takes less material to set a furnace
- *Does not crack or powder when furnace is fired immediately after applied*
- Will not shrink
- Keeps joints tight at all times
- Will withstand high temperatures
- Is not affected by temperature changes
- Eliminates material losses for it does not harden or freeze in containers

Nu-Dry is worthy of your consideration . . . use it on your next job.

Prices and jobbers' names furnished upon request.

THE PYROLITE PRODUCTS CO.
1221-31 W. 74th Street Cleveland, Ohio

Fan-Furnace Heating Systems

(*Continued from page* 20)

300 equals 2,356 feet per minute.

Brake Horse Power: We note this expression in the majority of fan catalogs as B.H.P., where the capacities are given.

The phrase is derived from the type of apparatus used in testing. Fig. 3 is a sketch of a shop made

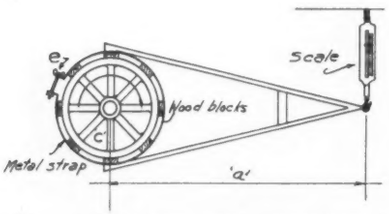


Fig. 3—This home made instrument is used to determine brake horse power. It is a brake whose force is measured in foot-pounds by the spring scale.

friction or brake testing apparatus. The pulley "C" rotates in the direction indicated by the arrow. While the pulley "C" is rotating, the load is applied by turning the screw "E" and is measured by the reading of the scale. The reading will, of course, be in pounds or in foot-pounds.

Brake horse power is calculated from the formula:

$$\text{B.H.P.} = \frac{2\pi AHW}{33{,}000}$$

Where A = length of brake arm in feet
H = revolutions per minute.
W = net load on scales
$\pi = 3.1416$

Example: Pulley on fan is rotating at 400 R.P.M.—Length of brake arm is 4 feet. Weight on scales is 1 pound 12 ounces; hence, we have

$$\frac{2 \times 3.1416 \times 4 \times 400 \times 1.75}{33{,}000} =$$

0.54 + B.H.P.

Efficiency: The mechanical efficiency of a fan is the ratio of brake horse power to the delivered horse power, thus we have a fan that delivers 3,000 c.f.m. against .35 inches of resistance. We have

$$\frac{.02 \times 144}{16} \times 3{,}000 = 5{,}400 \text{ foot pounds}$$

$$\frac{5{,}400}{33{,}000} = 0.1635 \text{ H.P.}$$

If under the test our B.H.P. is shown as .24, we have $\frac{.1635}{.24} = 68\%$ mechanical efficiency. This loss of 32% may be due to friction in bearings, design of fan blades, shape of fan, etc.

Motors

Any discussion covering motors is sure to be highly technical; hence of little use to the average heating and ventilating contractor. Possibly every community has a central power station or power utility office with some motor expert on the staff who can advise the contractor on the type of motor best suited to the installation on which he is figuring.

The electrician may not be familiar with fan characteristics, but if he knows the required horse power, the average length of time the fan will operate, the starting torque (medium for blowers) he will be able to advise the contractor in his choice of motors.

SOLVE YOUR HEATING PROBLEMS!

BRILLION
WARM AIR FURNACES

If customers complain of cold spots in the house . . . and they are not getting the most out of their fuel . . . that is the time to tell them to scrap the old furnace and to install a Brillion. Brillion does every heating job well . . . it has materially reduced fuel costs in practically every installation.

When you sell Brillion to your customers, you sell them certain satisfaction . . . and you realize a neat profit on each sale. Write for complete information now.

No. 100 Series

The 100 Series is a pipe furnace of two-piece radiator construction of the horseshoe type or two way travel. Radiator is convertible so that smoke pipe can be taken out at any convenient point. Casings can be furnished lined or unlined as an extra. Write for complete construction details.

BRILLION FURNACE COMPANY
BRILLION WISCONSIN

WHITNEY No. 2 PUNCH

Illustrated is our No. 2 Punch. Capacity 5/16-in. hole through 1/4-in. iron. Length 23-in. Weight 13 lb. Depth of throat 1 1/16-in. Stock sizes 3/32-in. to 1/2-in. by 64ths-in. Complete tool includes one punch and one die of specified size and die adjusting key.

THE WHITNEY LINE

In the W. A. Whitney line of Hand Lever Punches you will find a portable hand lever tool suitable for every requirement. They are made in ten sizes and types, ranging in size from the Tinners No. 4 Punch, which punches 1/4-in. hole through 16 gauge iron to the No. 92 Punch, capable of punching a 2-inch hole through 1/8-in. stock. Each tool has its special field of work as recorded in our latest catalog.

WRITE FOR CATALOG G

W. A. WHITNEY MFG. CO.
636 RACE ST. ROCKFORD, ILL.

VICTOR
FORCE AIR FANS

Powerful—Rugged—Dependable
Better Performance — Lower Cost

Here's a line of exhaust fans that give you greater value for your money than you can find anywhere else. They are built right and priced right—and they are guaranteed to give perfect satisfaction. Equipped with Victor's own super-powered motors, they will out-perform any ordinary fan. Sizes range from 6" to 16". Be sure to write for literature and prices today!

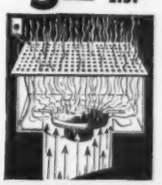
The Victor Heat Booster Brings the Heat Up Fast—Improves Heating Efficiency Greatly

Now, you can make any hot air system perform better. Pulls "cold air cork" out of pipes in a hurry—increases heat circulation—cuts fuel bills. Solves early morning heating problem—greater comfort for every furnace owner.

Only **$5.95** List

Easy to Install

Floor type booster fits neatly under register—connects to nearest electric socket. No trouble—just a few minutes to install. Wall type booster mounted on beautiful maroon finished panel which hangs on grille. A great profit item for any furnace repairman—write for complete details now!



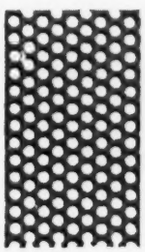
VICTOR ELECTRIC PRODUCTS, INC.
744 Reading Road Cincinnati, Ohio

PERFORATED METALS

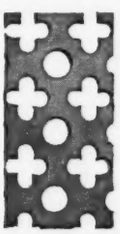
Brass, Bronze, Copper, Steel, Stainless Steel, Aluminum, Monel, Zinc, Tin Plate, Lead, or any other sheet material perforated to your order. Perforations in rounds, oblongs, squares and special shapes. Complete stock of brass and tin in small sizes.

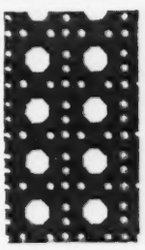
Accurate, durable product. Send us your next specifications.

FOR ARCHITECTURAL GRILLES
RADIATOR ENCLOSURES
SAFETY GUARDS
And for all screening and sizing operations.



Prompt, careful work
Pleasing prices





The Harrington & King PERFORATING Co.

5649 Fillmore St., Chicago, Ill. New York Office, 114 Liberty St.

Run this ad in your newspaper

Now!
(Mats Free)

Cash in on the great "depression-built" market—on the thousands of burned-out fire pots.

Repairs CRACKED FIREPOTS

at fractional cost, at a higher profit for you. Any type make or model can be repaired indefinitely without delays for new castings, without heatless days.

FIRELINE has taken the country by storm. It's your big opportunity today. Write for full details and

FREE *Sample of FIRELINE Newspaper Matrices, Circulars and Displays. Full particulars on installation and profits.*

Fireline Stove & Furnace Lining Co.
1865-M Kingsbury St., Chicago, U. S. A.

A New Discovery
Gives More Heat—Saves Fuel
Seals Cracks—Reduces Soot & Ash

For any furnace, stove, or boiler—

Line your heater wi
FIRELIN

THIS new refractory material more heat from less fuel. It gi hotter fire—reflects the heat acros fuel bed, giving you a good, hot fir the firepot. Holds fire over nig about complete combustion; eli burned fuel in the ashes. Consumes unburned fuel partic smoke and soot. You get heat i No dirty curtains — no dange chimneys.

SEALS CRACKED F

Seals cracks and holes in firep them better than new. Stop into the house. Cheaper t necessary to take down 2000 deg. F. Pro out. Get

Copyright 1935, Philbrico Jointless Firebrick Co.

The contractor may be asked what power consumption there is for a 5 horse power motor he plans to install for a church job.

Referring to the table in Table A we find that a 5 H.P., three phase motor requires 4,550 watts input per hour, or 4,550 divided × 1,000 equals 4.55 K.W. If the cost is 5 cents per K.W., our power cost is 4.55 times 5 equals 23 cents per hour approximately.

TABLE A

TO CALCULATE THE POWER CONSUMPTION OF MOTORS

Single Phase Motors

H.P.	P.p.m.	Watts	Efficiency
1	1200	1035	.72
2	1200	1990	.75
3	1200	3000	.745
5	1200	4750	.785
7½	1200	6800	.82

Three Phase Motors

1	1200	983	.76
2	1200	1845	.81
3	1200	2740	.815
5	1200	4550	.82
7½	1200	6660	.84

3 Phase

$$\text{Horse Power} = \frac{V \times C \times \sqrt{3} \times \text{Eff.} \times \text{P.F.}}{746}$$

$$C = \frac{\text{HP.} \times 746}{V \times \text{Eff.}}$$

Single Phase

$$\text{Horse Power} = \frac{V \times C \times \text{Eff} \times \text{P.F.}}{746}$$

$$C = \frac{\text{H.P.} \times 746}{V \times \text{Eff.} \times \text{P.F.}}$$

Where:

V = Volts
C = Amperes
Eff. = Efficiency
P.F. = Power factor (80)
H.P. = Horse power
$\sqrt{3} = 1.73$

TALK ABOUT THE LONG LIFE OF FURNACE CASTINGS!

Many FAULTLESS installed 40 years ago are still giving fine service.

The durability of a furnace is dependent upon its construction DESIGN as well as upon the quality of its castings.

One of the FAULTLESS long life features is the specially constructed gas-tight center joint of our radiator which provides for the expansion and contraction that frequently wrecks other types of radiators.

Years of experience in the design and manufacture of high grade furnaces is a desirable guarantee.

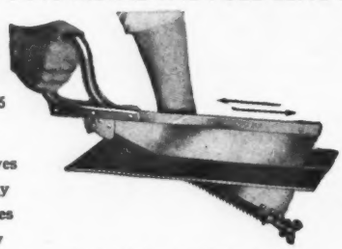
Our Agency proposition insures protection.

FAULTLESS HEATER CORPORATION
MANUFACTURERS
SUCCESSOR TO THE GRAFF FURNACE CO.
1220 MAIN AVE. CLEVELAND, OHIO

"True to the Name"
FAULTLESS
WARM AIR FURNACES

THE MOST AMAZING SAW EVER INVENTED
BLADES WILL NOT BREAK
CUTS METAL THE FULL LENGTH

Use Standard Blades 12x½x.025



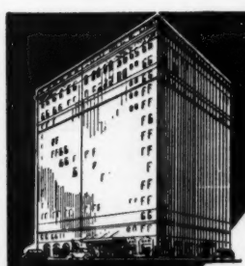
PRICE $2.50 EACH

Frame Moves Horizontally
Blade Moves Diagonally

Send for Circular and Quantity Discounts

"It's All in the Blade Angle"

WARD MACHINERY COMPANY
564 W. Washington Blvd. Chicago, Ill.



Pleasing Atmosphere at HOTEL MELBOURNE

There's a warm friendly atmosphere that makes you feel at home the minute you enter its doors. Hotel Melbourne is close to all points of interest in St. Louis. Wonderful food at moderate prices.

LINDELL BLVD. AT GRAND AVE.
ST. LOUIS

O. P. GREATHOUSE, Manager

400 ROOMS from $2.50 WITH BATH

"Build Your Own"

HOBART "Simplified" ARC WELDER
SAVE $300 TO $500

Lets you build a complete Hobart 40 Volt Arc Welder by using your own motor or gas engine . . . it's the most profitable outfit for both inside and outside work.

30 DAYS TRIAL—to prove it.
Write today for details—no obligation.

FREE

Check above the book you're interested in.
HOBART BROS. Box AR-125 Troy, Ohio

The Big Name in
HEATING
and AIR CONDITIONING
is
MUELLER-MILWAUKEE

RYERSON
IMMEDIATE SHIPMENT FROM STOCK

More than twenty kinds of prime quality sheets are carried in stock. There is a special sheet for every purpose. Also Bars, Angles, Rivets, Bolts, Tools and Metal-Working Machinery.

Write for Journal and Stock List

JOSEPH T. RYERSON & SON Inc.

CHICAGO DETROIT MILWAUKEE ST. LOUIS JERSEY CITY CINCINNATI BUFFALO CLEVELAND PHILADELPHIA BOSTON

SHEETS

MAKE COMPARISONS FOR YOURSELF

Compare Gardiner Acid-Core Solder with any other make—try it in your own shop for general use. Note the neater, faster work. A generous sample upon request.

Compare its price — Gardiner Solder actually costs less than ordinary solders.

Be sure and specify "Gardiner" when ordering from your jobber.

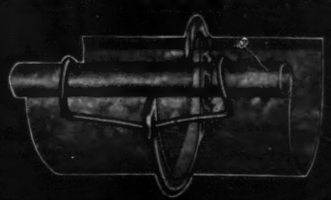
Available in 1, 5 and 20-lb. spools.

Gardiner METAL CO.

4831 So. Campbell Ave., Chicago, Ill.

"BB" QUALITY

Order from your jobber



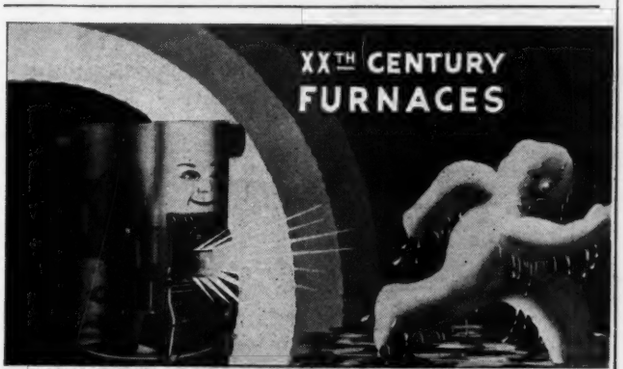
Saves time and labor

"BB" SPRING CIRCLE CLIP

Furnished only with "BB" Circles at no extra charge over old style straps.

BERGER BROTHERS CO.

229-237 Arch Street, Philadelphia, Pa.

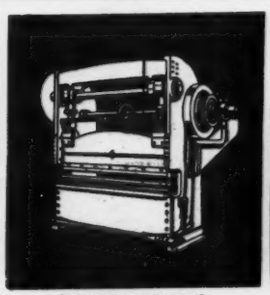


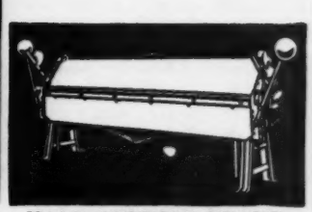
KEEP OLD MAN WINTER ON THE RUN

XX TH CENTURY HEATING & VENTILATING CO.

AKRON, OHIO

CHICAGO





PRESS BRAKE HAND BENDING BRAKE

Steel Brakes—Presses—Shears

DREIS & KRUMP MFG. CO.

7404 LOOMIS BLVD. CHICAGO

RESOLVED:

That the ACME HEATER which has proven a sensation in 1935 will be installed in all my jobs in 1936. Assuring my customers the finest HEATING SYSTEM obtainable. Write for Complete Data now.

ACME HEATING & VENTILATING CO.

Incorporated

4226-8 S. Lowe Ave. Chicago, Ill.

IN STOCK

1,000,000 Pounds Furnace Repairs
Pots Grates Feed Sections
1,000,000 Pounds Stove Repairs
Oil Stove Repair Parts & Wicks
Guaranteed To Fit

Fast, Accurate Shipments

METZNER STOVE REPAIR COMPANY

EST. 1880

515 Wyandotte Kansas City, Mo.

Cutter Mfg. Co.

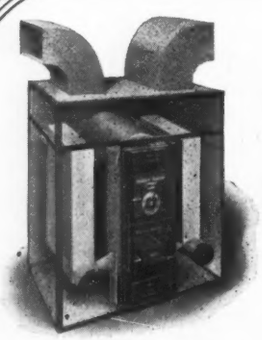
(*Continued from page* 13)

equally interesting story in its fabrication of fixtures. By fixtures is meant all types of kitchen equipment as well as all types of counters, service cabinets, steam tables, short order ranges, food cooling cabinets, sinks, drainboards, dish washing cabinets, dish racks, and numerous other special items.

Many of these items have been developed in the Cutter shop to meet local conditions and methods of operation. For example, bright metal tops are popular. Indeed, whole front and back counter assemblies with bright metal tops, fronts and ends have been designed, fabricated and installed by the company.

As a result of the amount of work done in this field, the company has worked out designs and methods of interest. Counter units are built up of light weight shapes (usually angles and channels), using round pipe with ball ends as feet, and covered on sides where the metal does not show with galvanized iron. Usually tops, fronts, ends and other surfaces which the public sees are stainless steel, because this material has proved itself resistant to restaurant acids and oils, is unaffected by daily cleaning and polishing, and does not show wear.

Because stainless steel is easier to weld than to solder, the Cutter Company employs both electric arc and



The Furnace Dealer's Ace in the Hole!

Investigate Modern Hearth Furnaces of radically new square design and you'll know why they are an "Ace in the Hole." They have features many buyers want and can get in no other furnace:

Supplied with or without the TWO-FUEL FEATURE that permits changing from coal to gas and back again by simply moving a lever.

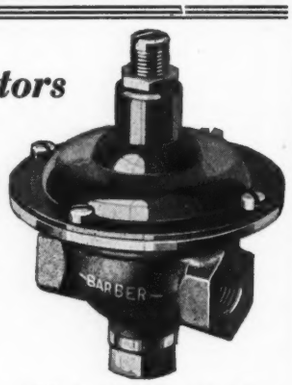
Designed for gas with higher heating efficiencies due to greater heating surfaces and longer fire travel. Adaptable to use with any air conditioning system, oil burner or automatic stoker.

Modern Hearth Furnaces complete any good line. They fit into your selling plan like a glove meeting certain needs where other furnaces do not fill the bill. WRITE TODAY.

MODERN HEARTH FURNACES
THE THOMPSON MANUFACTURING COMPANY
30TH. & LARIMER STS. SINCE 1878 DENVER, COLO

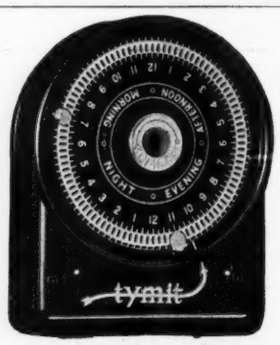
Barber Gas Pressure Regulators

Increasing numbers of Gas Appliance Manufacturers, Gas Companies, Jobbers and Dealers have switched to Barber Regulators because of their exceedingly low pressure drop, compactness, bronze bodies, precision of operation and their 100% value for the price. Why not write today for "stock" samples, complete literature, prices and discounts on the entire Barber line of Burners and Regulators?



The Barber Gas Burner Co.
3702-4 Superior Avenue
CLEVELAND - - - - OHIO

Made in ¼", ⅜", ½", ¾" 1", 1¼", 1½" and 2" sizes.



$8.05 net

Tork Clock Company
GRAYBAR BUILDING
NEW YORK CITY

Please send me quantity prices and wiring diagrams for connecting TYMIT, your new popular time control for

- ☐ oil burners
- ☐ gas burners
- ☐ stokers
- ☐ ventilating fans

Name .....
Address .....
City ..... *State* .....

ALL REPAIR PARTS for FURNACES BOILERS STOVES RANGES

A.G. BRAUER SUPPLY COMPANY
316 NO. THIRD ST. + SAINT LOUIS
IN STOCK • READY FOR IMMEDIATE SHIPMENT

Install ÆOLUS *Improved* VENTILATORS

FOR industrial buildings, schools, homes, theaters, etc. Made in 14 different metals. Constant ventilation—no noise—no upkeep.

ÆOLUS DICKINSON
Industrial Division of Paul Dickinson, Inc.
3332-52 South Artesian Avenue
Chicago, Ill.

gas welding, depending on the particular features of the unit. Jigs, dies and cooling plates have been worked out for most of the standard items so that either type of welding may be used. Such important welds as mitered corners of tops, which must be absolutely smooth when finished, have been simplified by experiment so that the least amount of grinding is needed.

Shop Practices

The frames are frequently cut and welded rather than sawed, bolted, or riveted, another time and labor saving short cut. Spot welding apparatus is used extensively in the forming of small items which go with the general line of equipment.

Shop procedure and methods have been worked out and mechanics trained to handle these contracts with a minimum of lost time and waste of material. This applies not only to machine operations, but to all work in the shop. Sheets of stainless steel, as received crated, are placed where damage or scuffing will not occur. The sheets are removed from the crate only as needed, thus reducing danger of scratching the surface. When placed on the benches for cutting, a heavy padding of paper is placed under the steel, and all work is done on the unpolished side. So far as practicable, similar precautions are taken during all machine operations, the sheets being protected by paper in the brake or shears. Whiting is often rubbed over the surface and left on until the item is finally ready for installing.

Finishing

Where welding or fitting must be done after forming, the welds are all ground down with portable grinding wheels and buffers, and later polished by machine buffers and pads. Welding methods and seaming have been worked out to create as few welds as possible, placed in locations taking the least wear.

As may be seen by the photographs, the Cutter Company has developed several counter items—even such pieces of apparatus as short order ranges—designed to meet the particular specifications of the operators. In most cases, these special items were first built to meet the needs of a particular job, but use showed the item's value, so that its general design was made the basis for standard equipment with similar characteristics.

In the years that the Cutter Company has been building restaurant equipment these initial special orders have grown into a practically complete line of cold storage cabinets, dish racks and cabinets, counter sections for service or display, back counters, sinks and work tops, varying mainly in length, but following designs which have proved satisfactory in service.

CLASSIFIED ADVERTISING

4 cents for each word including heading and address. Count seven words for keyed address. Minimum $1.00 for each insertion. One inch $3.00. Cash must accompany order. Copy should reach us eight days in advance of publication date. Display rates for this page will be furnished on request.

SITUATIONS OPEN

Use AMERICAN ARTISAN Classified Advertising for quick results. It puts you in direct touch with the buyers and sellers in the warm air heating, sheet metal contracting and air conditioning industry.

WANTED: First Class Sheet Metal Worker, around 40 years of age. Must be good inside workman for a shop doing skylight, ventilating and blow pipe jobs including all kinds of outside jobs, tin roofs, gutters, ceilings, etc. Prefer an all around workman, a mechanic with full knowledge of the business, able to estimate and take full charge if requested to do so. (Reference required) and don't waste time writing unless you are positive you can qualify. Address Klugel & Son, North Emporia, Virginia.

WANTED: Dealers—Distributors. DADCO Automatic Damper (stack limit and draft control for warm air furnaces). Saves fuel. Low price. Non-electrical. Dutcher Heating Company, Canton, Mass.

MISCELLANEOUS

FREE SAMPLE

Non-Con-Dux Cold Water Paste—enough to make 1 Gallon of smooth, strong, easily mixed, triple-refined paste . . . the BEST ever made for applying asbestos paper—will be sent to anyone in Michigan, Wisconsin, Illinois, Indiana, Kentucky, Iowa, Missouri, Minnesota. All you have to do is write on your letterhead. We want you to try it and prove its superior qualities at our expense. Write for Your Sample

GRANT WILSON, INC.,
4101 W. TAYLOR ST., CHICAGO, ILL.

If you have anything to sell, if you are looking for a "good buy," if you are seeking a connection or if you are looking for a salesman—use the Classified Page of AMERICAN ARTISAN.

FOR SALE

Sheet Metal Machines
New and *Really Rebuilt*

A machine for every use and every machine is ready for use. The largest stock in Chicago. Ask for list.

Complete supplies and tools.

MAPLEWOOD MACHINERY CO., Inc.
Chicago
2634 W. Fullerton Ave. Brunswick 9200
561 W. Washington Blvd. State 1405

MISCELLANEOUS

Patents and Trade Marks
Philip V. W. Peck
Barrister Bldg., Washington, D. C.

MAKE SOME MONEY AND HAVE SOME fun doing it. Put on a minstrel show, play, operetta. Trade and social groups are following the idea successfully with our material—plays, operettas, musical comedies, minstrels, comedy and revue songs, blackface skits, vaudeville plays and songs, musical readings and other entertainments; make-up goods. Catalog free. T. S. Denison & Co., 623 So. Wabash. Dept. 26, Chicago.

YOU CAN BENEFIT BY BUYING EFFICIENT
Sheet Metal Machinery at INTERSTATE

PEXTO

Appointed Distributors
Chicago Territory

SUGGESTIONS FOR TIME SAVING MACHINERY

Roll, Slip 36" long 14 ga. $ 75.00
Mighty Midget Unishear.. 40.00
Clough Sign Hand Punch. 35.00
Brake, Chgo. St. 3' B & P 125.00
Shear, Power, 10' 14 ga... 575.00
Crimper & Beader, 24 ga. 10.00
Elec. Drill ¼" B. & D...$ 15.50
Flexible Shaft ½ H.P..... 50.00

Brakes Chgo. St. Hand, 8'18; 8'16; 8'14; 6'18; 10'16; 10'14; 6'16; 8'12; POWER — 10'10; 8'¼".
Roll, Slip, 10/ 18 ga.... 225.00
Rolls, 30"x2"; 10'⅜"; 8'¾" 16'¾".
Press Brakes, 10'10 ga.; 10'⅛".
Welders, arc 150, 200 & 300 Amp.
Shears, Power, 12'⅜"; 10'⅛".

Visit Our Permanent Display Pexto Products. Just received 2 carloads PEXTO Sheet Metal Machines and can make immediate shipment.

Don't let your Surplus Machinery stand idle. TRADE IT IN on Interstate Guaranteed Reconditioned Equipment. We carry America's largest stock Modern Machinery at prices that will suit your bank book. Let us quote.

"A MACHINE FOR EVERY PURSE AND PURPOSE!"
"Draw on the Most Complete Stock in America"

Write for Bargain Bulletin No. 835-A

NEW & USED — PRESS BRAKES — HAND MACHINES — STAKES — ROLLS — SHEARS — BRAKES — PUNCH PRESSES — BUTT. ARC & SPOT WELDERS — FOLDERS — HAND & POWER

INTERSTATE MACHINERY COMPANY
130 S. Clinton St. . . . . Chicago
(FREE PARKING)

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Drawn for Revere Copper and Brass Incorporated by Edward P. Crosse

Call to Meeting

One of Paul Revere's first copper and brass assignments was to recast the bell for the Old North Church, the church where the warning lanterns in the belfry started Revere on his memorable ride to Lexington. When the bell was finished, its tone was so wonderfully clear and true that similar orders came thick and fast. In all, 396 bells were cast for various New England churches; seventy-five of these are known to be still in use. But Revere bells, brass cannon, copper spikes and rivets were soon supplemented by a still greater achievement.

In 1801, Revere mastered the secret for rolling copper, a process never before accomplished in America. Copper sheets from his new mill soon protected the hull of the famous frigate "Old Ironsides," the roof of the Boston State House, and many other public and private buildings up and down the coast.

Paul Revere's ability as a copper and brass manufacturer, inventor, and industrialist is still serving America. Through succeeding generations, the original firm of Paul Revere & Son has grown and consolidated to the present nation-wide organization of Revere Copper and Brass Incorporated.

The Revere heritage of leadership in copper and brass has been continued through the years. Revere is, today, America's leading supplier of sheet copper . . . available in all commercial sizes, gauges, tempers, and finishes. Among the newer copper products are Revere Leadtex (lead-coated sheet copper), Revere Thru-Wall Flashing, and Cheney Flashing. Ask your distributor for Revere.

We are happy to take this opportunity to wish you a very Merry Christmas and a Bright and Prosperous New Year.

Revere Copper *and* Brass

INCORPORATED

FOUNDED BY PAUL REVERE 1801

EXECUTIVE OFFICES: 230 PARK AVENUE, NEW YORK CITY · MILLS: BALTIMORE, MD. · TAUNTON, MASS. NEW BEDFORD, MASS. · ROME, N. Y. · DETROIT, MICH. · CHICAGO, ILL. · SALES OFFICES IN PRINCIPAL CITIES